

5.0 PLAN FORMULATION

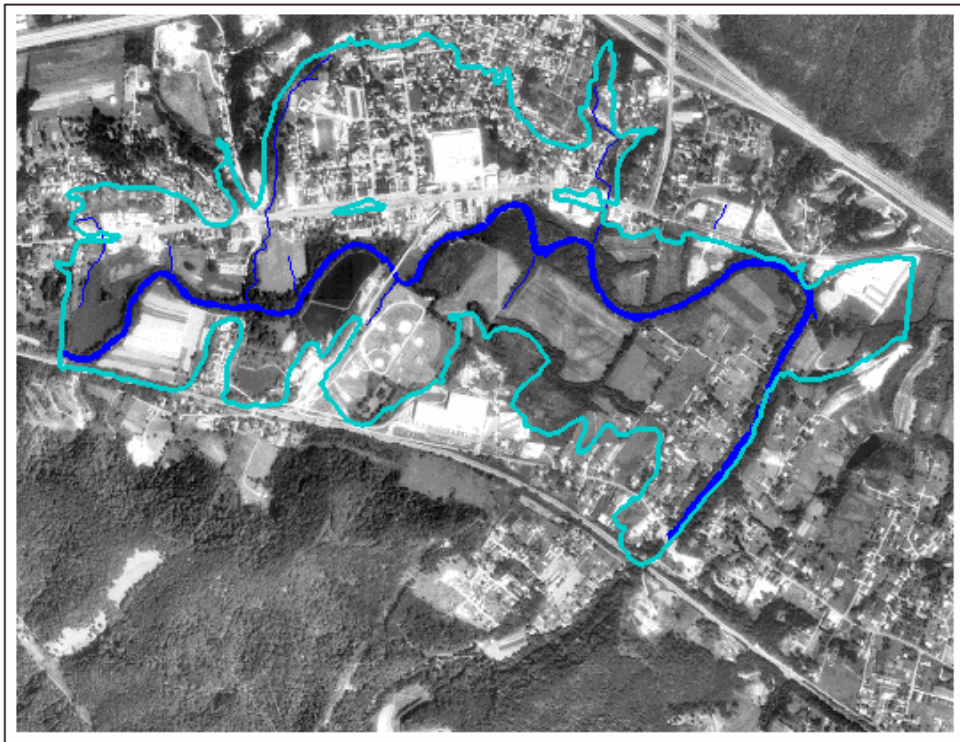
This section summarizes the planning process by which project alternatives were developed and analyzed to arrive at a selected plan.

5.1 PROBLEMS, NEEDS, AND OPPORTUNITIES

Flooding History

Milton has a history of flooding dating back to the early 1900's. Major floods occurred in 1913, 1939, 1978, and the most recent in 1997, which is considered to be the flood of record. The ten largest floods at Milton, based on peak discharges at the Mud River gage are displayed in Table 5-1. Flood conditions at Milton are a result of both natural features and development activity. Upstream from Milton the Mud River watershed is characterized by steep gradients and rather narrow valleys which can cause high flood peaks. When the flows reach the wide floodplain at Milton, the flood waters spread out over the valley inundating much of the business and residential areas located north of the Mud River between US 60 and I-64. A flood in December 1978, an estimated 10% chance (10-year) flood event, inundated a substantial part of Milton in what most considered at that time to be the flood of record. Refer to Figure 5-1 for the 100-year floodplain boundary.

Figure 5-1. 1% Chance (100-year) Flood Event Boundary



(1) December 1978 Flood

This flood was the result of an average 4.9" of rainfall in 24 hours over the Lower Mud River Basin. The flood was the highest on record at Milton, overtopping highway US 60 by nearly 2 feet in the center of town. During this event, an estimated 500 residents and 100 businesses in western Cabell County including structures within the city limits of Milton were damaged, along with schools, streets, and parks.

(2) March 1997 Flood

Approximately 8" of rain fell on the Lower Mud River basin from February 28th to March 3rd, resulting in the most damaging flood ever at Milton. The flood levels in the downtown area were about 6 inches higher than in December 1978, the previous record flood, although the estimated discharges were slightly lower. An estimated 362 residences, 86 businesses, and 20 public and institutional buildings including two schools were damaged by flooding in Milton. Some residences and businesses along US 60 near the river had flood waters 1.5 to 2.0 feet over the first floors. Total damages for the Milton area were estimated to be approximately \$23 million (1997 dollars). Approximately 16 homes were acquired under the Federal Emergency Management Agency (FEMA) buy-out program due to the 3.7% chance (27-year) flood event. Figures 5-2 and 5-3 below show some of the flooding in Milton.



Figure 5-2. Flooding along Smith Street during the March 1997 flood in downtown Milton.



Figure 5-3. Flood waters surround Milton Elementary during the March 1997 flood.

(3) February 2003 Flood

Approximately 1.5" of rain fell on the Lower Mud River basin during the February 17th weekend. This rain fell on an existing snow pack of several inches and resulted in flooding along Georgia Avenue and the low lying areas of Milton. This event is considered to be approximately a 10% chance (10-year) flood event and inundated both schools in Milton. Please refer to Figure 5-4.

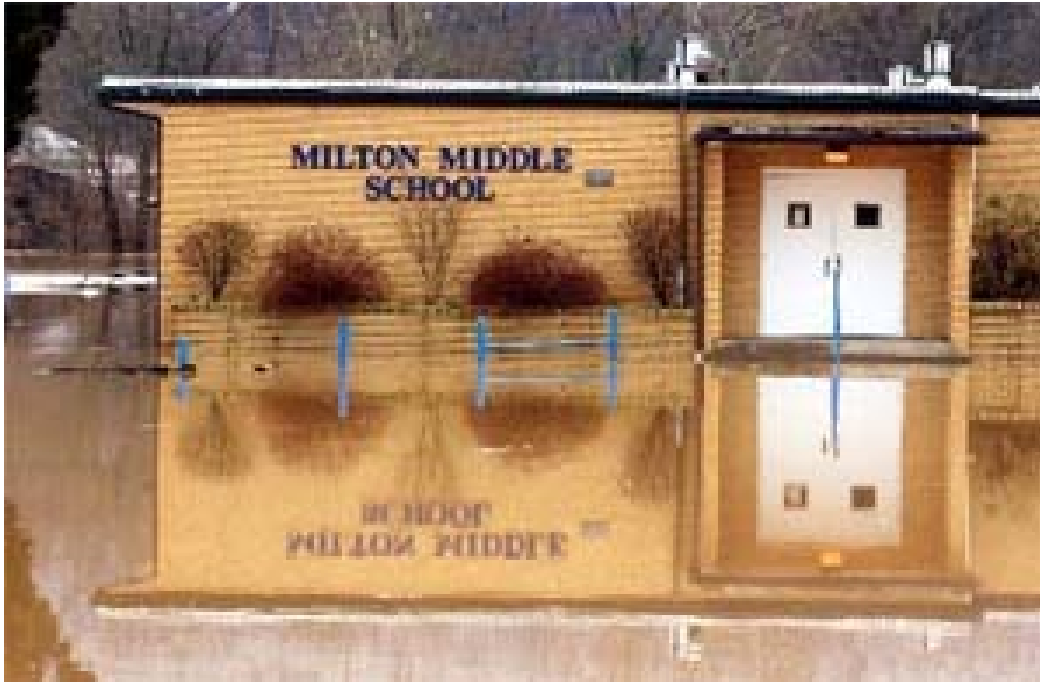


Figure 5-4. Milton Middle School during the February 2003 flood.

Table 5-1
Peak Flood Flows on Lower Mud River
 (Gage upstream of Milton¹)

Rank	Occurrence Year	Estimated Peak Discharge ¹	Estimated Frequency (Year)
1	1978	20,700 cfs	34
2	1939	20,600 cfs	34
3	1997	19,000 cfs	30
4	1913	19,000 cfs	30
5	1962	18,800 cfs	14
6	2003	15,000 cfs	10
7	1943	14,400 cfs	10
8	1967	13,400 cfs	8
9	1951	12,200 cfs	7
10	1968	11,200 cfs	6

¹ Flows at gage on Mud River, 27 miles upstream from Milton.

The following is a table that shows the number of structures damaged in the project area during a 1% chance (100-year) flood event.

**Table 5-2
Structures Damaged During a 1% Chance (100-year) Flood
Event In the Project Area**

Structures Damaged during a 1% Chance (100-year) flood event	Milton	Georgia Avenue Area
RESIDENTIAL Homes & Storage Units	465	85
Mobile Homes	43	
NON-RESIDENTIAL Commercial	119	
Institutional (Government, Schools, Churches, etc.)	22	
Total structures	651	85

5.2 PLANNING OBJECTIVES

Based upon the identified problems, needs, and opportunities within the study area, the desires of local interests, and the intent of the aforementioned authorization, the following planning objectives have been established for this study:

- Conduct a reevaluation of the Lower Mud River Watershed Plan and EIS developed by the National Resource Conservation Service (formerly SCS) and determine the most feasible alternatives for reducing flood damages at Milton;
- Develop the most economically feasible (NED) and the most environmentally and socially acceptable plans for providing flood protection at Milton;
- Define the Federal interest consistent with Corps policies, cost-benefit analysis, and environmental impacts of alternative plans; and
- Determine the overall public support for the selected plan and identify non-Federal entities with the interest and financial capabilities for cost sharing potential project construction.

5.3 PLANNING CONSTRAINTS

- Alternative plans must be compatible with provisions of the National Flood Insurance Program (NFIP) in Milton and Cabell County;

- The recommended plan of development should be the National Economic Development (NED) plan, unless there are important reasons to select another alternative;
- The recommended plan must have the support of the City of Milton, Cabell County and the general public; and
- The non-Federal sponsor should be capable of sharing cost for project construction and assuming operation and maintenance responsibilities.

5.4 ALTERNATIVES

This section discusses all measures and alternatives considered in the planning process for the Milton flood control project. Section 5.4 is divided into three main sections which discuss the initial, intermediate, and final screening processes used to define and evaluate all reasonable measures that could meet the Congressional direction to provide flood protection for the City of Milton.

5.4.1 Alternatives Considered (Initial Screening)

This section discusses the alternatives initially considered in the planning process (See Section 3.0 Prior Studies and Reports). Costs for these alternatives were developed during initial screening without the benefit of detailed engineering studies such as geotechnical investigations, detailed hydrologic and hydraulic information, or HTRW investigations

5.4.1.1 Upstream Impoundments

The Natural Resource Conservation Service (NRCS) formerly Soil Conservation Service, considered upstream impoundments (flood retarding dams), as part of its investigations for the Lower Mud River Watershed Plan completed in 1993. The agency evaluated eleven single purpose impoundments on ten different streams throughout the watershed. Only one impoundment site which was located on Trace Fork was marginally feasible. This site would impact over 500 acres of residential and farm properties. More than 21 homes and farmsteads would be displaced. This project was opposed by the local residents because of the significant social impacts and large land requirements. The local sponsor also opposed further consideration of the project because of the large cost sharing requirements. Consequently, the agency dropped further consideration of upstream impoundments as part of the watershed plan. The Corps has determined that the significant acreage requirement an impoundment or any other impoundment in the watershed validates the reason not to reevaluate the impoundment sites identified in the prior Watershed Plan.

5.4.1.2 Floodwalls/Levees

Levees and floodwalls were investigated at Milton by the NRCS as part of the Lower Mud River Watershed Plan. The levee plan proposed by the NRCS included a section of new channel near the upstream end of the project which would minimize impacts to residential and commercial properties located near the river. The general alignment for

most of the levee would be along the north bank of Mud River, providing flood protection to the commercial and residential center of Milton. The levee could provide protection, depending on the height, from a recurrence of the 1997 flood (20+ year frequency) up to the 500 year frequency (.02% flood). At the lower levels of protection, pumping requirements for interior drainage would not be as great and highway gate closures would not be necessary. The higher protection levels would require two pump stations and at least one gate closure across US 60. Another option is to construct the levee entirely along the north bank of the river, which requires acquisition of several businesses and residences. No channel modifications are necessary with this alternative.

An area south of Mud River and east of Milton also is subject to flooding. This residential area primarily along Georgia Avenue is outside of any protection that would be provided by a levee around the City of Milton, therefore, would require a separate levee unit. Because there is little natural high ground in this area, only relatively low levels of flood protection could be provided.

5.4.1.3 Channel Modification

Widening, deepening and straightening of the Mud River channel would increase the discharge capacity and reduce the overbank flow during major floods. Such channel improvements were recommended by the NRCS in the Lower Mud River Watershed Plan, May 1993. The potential project would extend along nearly three miles of Mud River from near the Milton water supply intake downstream to just below the I-64 Bridge. The primary modifications would include channel widening and deepening, and construction of new channel sections across stream meanders.

5.4.1.4 River Diversion

A new section of Mud River channel could be constructed upstream from Milton, so that flood flows would be diverted around the town. The diversion channel would begin about one-half mile upstream of the railroad trestle on East Mud River Road, cut through a high ridge and then follow the Dry Creek channel to Mud River, a total of about 1.5 miles. The project would include a dam-like structure on Mud River just below the diversion entrance, a 60-foot wide diversion channel, and a large pump station at the downstream end of the channel. Construction of the diversion channel would require a significant quantity of excavation, as well as the relocation of highway and railroad bridges.

In addition to the complete diversion of Mud River, a “high-flow only” diversion was considered. However, since Milton receives damages at relatively low events and the waters recede slowly, the “high-flow only” diversion was not considered to be a practical solution. Flows at the five-year event begin to flood significant numbers of structures. Also there would be additional costs for the high-flow only diversion structure and increased operation and maintenance requirements. Environmental considerations would be extreme for this type of flood control measure even if some amount of low flow were allowed to remain in the original channel. Therefore, a complete diversion of the Mud River was considered in the initial array of alternatives.

5.4.1.5 Nonstructural Measures

Nonstructural measures are designed to reduce flood damages without altering the nature or extent of flooding and are voluntary. Typical nonstructural measures include floodproofing, temporary relocation, flood warning and emergency evacuation plans. Flood proofing normally involves elevating individual structures or relocating the structure to a flood-safe area. For large commercial, industrial or public structures, individual measures such as ring levees or veneer walls can be utilized. Structures would be acquired if the flood proofing cost exceeds the property value, or if the structure is unsound and can not physically be raised or relocated. Permanent floodplain evacuation would involve acquiring flood prone property and relocating the structure to another site only if the structure was unable to be floodproofed. A flood warning system can be important in locations where flood velocities are high and evacuation may be difficult, because of either terrain or limited transportation facilities. However, the Mud River typically is not “flashy” in nature and rises slowly during rainfall events. The river is also influenced by backwater from the Ohio River.

Another nonstructural measure is the FEMA’s Hazard Mitigation Grant Program (HMGP) which uses funds to acquire and demolish structures in flood-prone areas from willing sellers. The land is then dedicated as open space as a flood-control measure. After the 1997 flood event, approximately 16 residential structures were acquired.

5.4.1.6 Summary of Alternatives Considered (Initial Screening)

The NRCS investigation in the early 1990’s determined that only one upstream impoundment site was marginally feasible and that there was significant land and real estate requirements and social impacts for its development. Therefore, the Corps has not determined any need to further evaluate upstream impoundments.

Levees appear to be an effective means of reducing flood damages at Milton. One levee option incorporates a new section of Mud River channel in the upstream portion of the project. Such an alignment means that several businesses and residences along the north river bank would not be impacted by the project; however, environmental impacts would be significant.

Another levee alignment follows entirely along the north bank of Mud River with no channel modification. This levee option would require acquisition of several businesses and residences located near the river, however, the impacts to the stream channel would be minimized. Both levee alignments are effective means of reducing flood damages at Milton and both are being retained for further investigation.

The residential area along Georgia Avenue south of Mud River lies entirely within the 100-year floodplain and is subject to frequent inundation (1% chance flood event). The area is relatively flat with little natural high ground, making it difficult to provide flood protection. The most practicable structural measure would be a relatively short section of levee which would partially surround about 25 residences, and provide about 5% chance (20-year) flood event of protection. Higher levels of protection would result in total encirclement of the neighborhood and would present potentially unsafe conditions

in the event of an overtopping of floodwaters. This alternative is being retained for further investigation.

Modification of about three miles of Mud River channel near Milton was recommended by the NRCS in the Lower Mud River Watershed Plan and EIS, May 1993. This plan does not appear to be very effective in reducing major floods, and project construction would result in significant environmental impacts. However, since this was once the recommended plan, and there is some local support for such a project, this alternative is being retained for further investigation.

The diversion of Mud River through a new channel around Milton would be very effective in reducing flood damages for the town and the surrounding area. However, this is the most expensive of all the structural alternatives evaluated, with total cost estimated to be on the order of \$150 million. The social and environmental impacts from such a project would be substantial. Therefore, this alternative is being dropped from further consideration.

Nonstructural measures are being considered as alternatives to structural means to reduce flood damages at Milton. Complete relocation of Milton out of the floodplain is impractical and would not be supported by local interest. Because of the gentle topography and extensive transportation network available, a flood warning system is not crucial. Floodproofing which would involve raising or protecting individual structures appears to be the most practicable nonstructural measure. The effectiveness of such measures depends on the extent of participation by the home owner. Since floodproofing has potential for being highly effective, meets FEMA floodplain requirements, and results in minimum environmental impacts, this alternative is being retained for further investigation. A summary of the initial screening of alternatives is provided in Table 5-3.

**Table 5-3
Initial Screening of Alternatives**

ALTERNATIVE	DESCRIPTION	FLOOD REDUCTION EFFECTIVENESS	DEVELOPMENT COSTS	ENVIRONMENTAL IMPACTS	SOCIAL IMPACTS	LOCAL SUPPORT	CONCLUSION
Upstream impoundments	1 upstream impoundment on Trace Fork	Protection Level Low	Moderate	Significant	Significant	Low	Dropped ³
Levee with channel	Levee at Milton with short section of channel	Protection Level High (1% - 0.2% chance flood)	Moderate	Moderate	Low	High	Retained
Levee Along Bank	Levee along north bank of river	Protection Level High (5%-1% chance flood)	Low to Moderate	Low	Significant	Mixed	Retained
Levee at Georgia Avenue	Levee at Georgia Ave. residential area	Protection Level Low (5% chance flood)	Low	Low	Low	Mixed	Retained
Mud River channel Modification	4000' of new channel & 7500' channel widening	Protection Level Low (10% chance flood)	Moderate	Significant	Low	Mixed	Retained
Mud River Diversion	New channel cut through ridge to divert flood flows	Protection Level Very High (0.2% chance flood)	Very High	Significant	Significant	Mixed	Dropped ²
Non Structural Measures	Floodproofing residential & commercial structures	Protection Level High (1% chance flood) ¹	High	Low	Significant	Low	Retained

¹Effectiveness depends on participation; ²Not retained because of excessively high cost and impacts; ³Not retained because of excessive high impacts.

5.4.2 Alternatives Evaluated (Intermediate Screening)

This section discusses the evaluation of those alternatives retained from the initial screening (Section 5.4.1.6). Formulation at this level required additional technical information including more detailed design and cost estimates, economic analysis, and assessment of social and environmental impacts. This additional information has been used to determine which alternatives are feasible and should be further evaluated as final alternative plans.

5.4.2.1 Levee with Channel Section

This levee alternative at Milton includes the construction of a new section of Mud River channel near the upstream end of the project to allow the footprint of the levee to be moved south of the existing Mud River channel. The river would be diverted from the existing channel to the new channel. The levee would begin at the eastern edge of Milton near 84 Lumber, extend from US 60 south and then west about 1,800 feet crossing existing Mud River channel, then west about 2,000 feet crossing Mud River again before reaching the Mud River Road bridge, then generally west along the north riverbank; about 2,000 feet to Newmans Branch, and finally continuing along the river bank for about 2,000 feet to high ground near Abbot Lane. The total length of a levee along this alignment is approximately 7,900 feet, and includes 4,084 feet of new river channel. This levee alignment allows construction of a section of levee across low bottomland and away from several businesses and residences which are located along the riverbank. The city's water supply is taken from the river above a low head dam which is located east of Fairgrounds Road. This low head dam would be removed and relocated in the new channel. The area between the existing river channel and the levee embankment would be used for ponding of interior drainage, thereby reducing the size and cost of a pump station for Johns Branch. Another pump station would be located at Newmanns Branch to pump interior drainage from the western section of the project. The excavated material from the new section of channel, ponding areas and borrow area would be used for levee construction. Construction of this alternative would result in environmental impacts primarily from the loss of the natural stream channel. A levee alternative could provide protection from a moderate flood event such as the 1997 flood, to a rare event such as the 0.2% chance (500-year) flood event. The alignment generally would be the same, but the levee height and length would vary with the degree of protection. A levee providing protection against the 1% chance (100-year) flood event is estimated to cost \$37.5 million (October 2002 price level), including engineering and design, real estate acquisition and project construction. Such a plan would protect approximately 651 residences and businesses from first floor flooding, resulting in annual flood benefits of \$3.3 million. Costs and benefits for other levels of protection would vary depending on the height and length of the levee embankment. Figure 5-5 shows the general plan view of the levee with channel alternative.

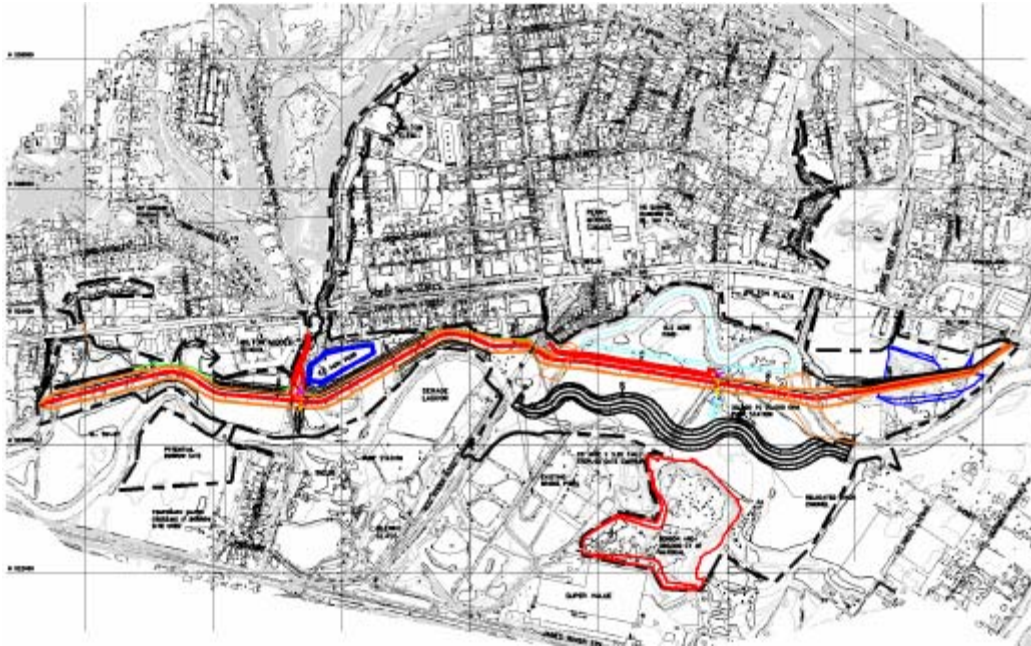
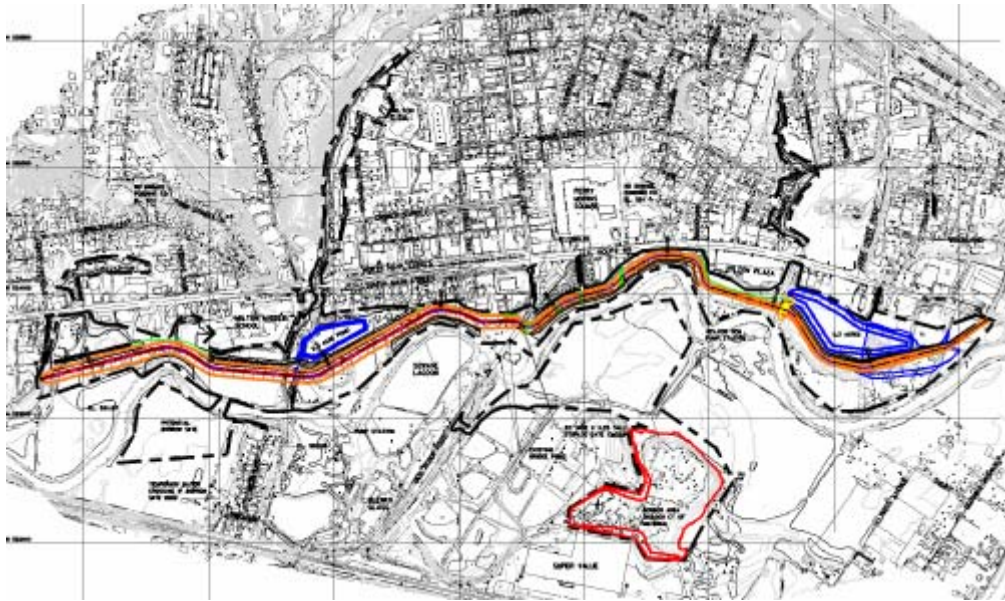


Figure 5-5. Levee with Channel Section

5.4.2.2 Levee Along River Bank

A levee providing flood protection at Milton can be constructed entirely along the north bank of Mud River without any channel modification. The western section of a levee along this alignment from Mud River Road to high ground near Abbott Lane would be the same as the levee alignment described in Section 5.4.2.1. However, the eastern section would vary somewhat depending on the level of protection. For a low levee which would protect against a recurrence of the 1997 flood, the embankment would begin just west of Johns Branch, then continue south and west about 1,000 feet to Mud River, then generally west along the north river bank about 1,600 feet to Mud River Road bridge abutment. This levee alternative would have a total length of about 6,700 feet, and would require two small pump stations but no highway closures. To provide protection against higher floods the levee embankment would need to cross Johns Branch and extend to high ground in east Milton near 84 Lumber. This plan requires a very large pump station to be constructed at Johns Branch. A levee that would provide protection against the 1% chance (100-year) flood event is estimated to cost \$49.6 million (October 2002 price level) including engineering and design, real estate acquisition and project construction. A levee with lower protection (3.7% chance flood event or 1997 flood) is estimated to cost about \$20 million less. Figure 5-6 shows the general plan view of this levee alternative.



5.4.2.3 Georgia Avenue Levee

There are an estimated 136 residential structures located in the Georgia Avenue residential area, at least 32 of which were inundated by the 1997 flood. With little natural high ground in the area, structural means for reducing flood damages are limited. The most practicable alternative is to construct a rather short levee along Mud River behind the residences in the Georgia Avenue area. The earthen levee would begin near the lower end of West Mud River Road and extend about 2,200 feet in an arc-like configuration to high ground near the intersection of Illinois Avenue and Short Street. The levee plan would provide protection against a recurrence of the 3.7% chance flood event or 1997 flood. Higher levels of flood protection cannot reasonably be provided because floods overtop the berm along the river road at elevations below the 2% chance (50-year) flood event. The levee at Georgia Avenue is estimated to cost \$3.1 million (October 2002 price level), including design and project construction. See Figure 5-7 below for a plan view of the proposed ring levee.

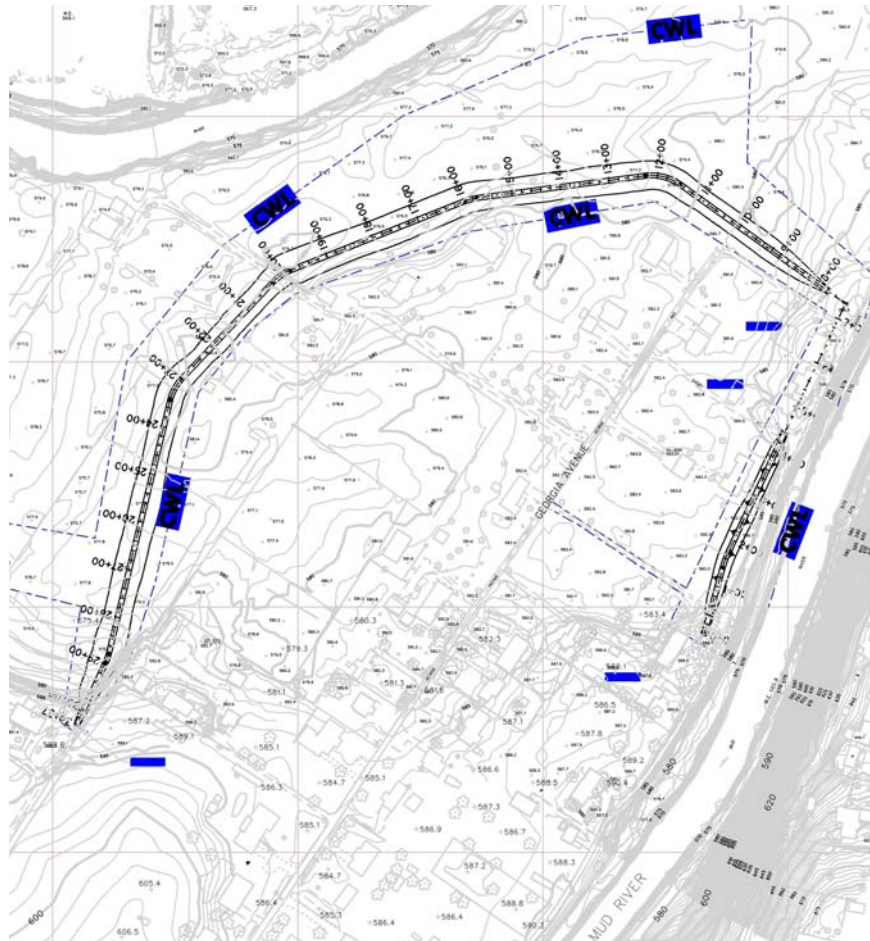


Figure 5-7. Georgia Avenue Levee

5.4.2.4 Mud River Channel Modification

This alternative includes widening and straightening the channel to improve the hydraulic characteristics along 2.8 miles of Mud River at Milton. The overall plan was originally developed by the NRCS and was recommended in the Lower Mud River Watershed Plan and EIS. The specific stream modification in the plan includes about 4,000 feet of new channel which would extend across the stream meanders; about 7,500 feet of channel widening and deepening; and 1,600 feet of overflow channel at the downstream end of the project. The channel project would begin near the Milton water plant and extend along Mud River to approximately 2,000 feet downstream of the I-64 bridge, where the overflow section ends. The new channel sections would result in the existing channel being shortened about 1,000 feet within the project limits. New channel sections would have a bottom width of 80 feet with 2.5:1 side slopes, and the overflow channel would be 50 feet wide and average about 6 feet deep. Rock weirs would be installed at certain locations along the new sections of channel to divert low flows through the stream meanders in order to maintain as nearly as possible the present (baseline) conditions. Project construction, particularly the new channel sections, would require approximately 800,000 cubic yards of excavation. The channel modifications would result in significant environmental impacts, particularly to aquatic habitat along the existing stream channel. Some impacts are estimated to be of such magnitude that

mitigation in kind on project lands may not be possible. The channel modification would reduce the 1% chance (100-year) flood event by about 1.7 feet and a recurrence of the 1997 flood by 2.0 feet in the center of town. The cost of the channel modification alternative including design, real estate acquisition, and project construction is estimated to be \$28.5 million (October 2002 price level). Figure 5-8 shows the modified layout of the NRCS channel.

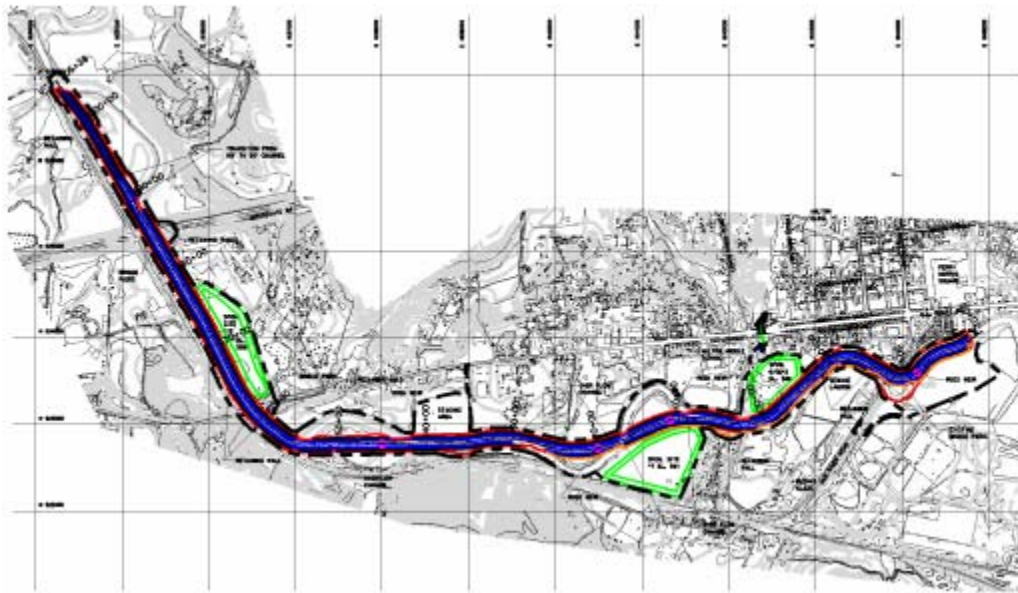


Figure 5-8. NRCS Channel

5.4.2.5 Floodproofing/Acquisition

Floodproofing of individual structures could significantly reduce damages from flooding. However, success of such an alternative plan is dependent on several factors, the most important of which is the physical ability to actually floodproof commercial buildings and other large structures such as banks, municipal buildings, and churches. Methods for floodproofing non-residential structures include raising in place, placing veneer walls on an individual structure to a maximum depth of 3 feet, and constructing ringwalls (low levees) if there sufficient land to construct. The willingness of both residential and commercial property owners to participate in a voluntary program is critical to its success. The floodproofing plan is based on raising residential structures so that the first floor would be above the 1% chance (100-year) flood event up to a maximum of 12 feet above existing ground surface. Residential structures would be floodproofed if the cost of raising is less than the cost of acquisition. The estimated floodproofing cost has been based on 100% participation by property owners; however, similar programs in other areas of Huntington District have demonstrated that actual participation is often not more than 75% of eligible structures. Owner participation of businesses and large public buildings is even less because in many instances it is physically impractical or cost prohibitive to floodproof large structures. Consequently, many large non-residential structures only would be eligible for acquisitions or relocation out of the flood zone. The

floodproofing plan evaluation is based on an estimated 736 residences and non-residential structures (businesses, public buildings, etc). The cost of a floodproofing plan for Milton is estimated to be \$109.1 million (October 2002 price level) assuming 100% participation by property owners. This total number of structures includes the Georgia Avenue area as well as the structures in Milton that receive first floor flooding from the Mud River.

5.4.2.6 Summary of Alternatives Evaluated (Intermediate Screening)

A levee at Milton with a new section of Mud River channel is effective in protecting most of the town including the business district from major flooding. Approximately 644 residences and businesses would be located inside the levee and protected from 1% chance (100-year) flood (89% of the total). The risk of potential flooding and flood cleanup and emergency costs would be reduced along with the cost of flood insurance would be avoided. Environmental impacts resulting from the channel modification would be considerable and potentially adverse. Protection provided by this alternative can vary considerably depending on the height of the levee embankment. A levee designed to protect against the 1% chance (100-year) flood event has been used as a typical alternative plan for intermediate screening. This plan is very effective in preventing flood damages, is economically feasible, and has considerable net benefits. Total cost is estimated to be \$37.5 million (October 2002 price level), including engineering design, project construction, and land acquisition. This levee alignment was retained for evaluation as a final alternative. Pertinent data for this alternative is summarized on Table 5-4. Further evaluation to determine the optimum levee height is discussed in Section 5.4.3.

Another levee alternative is the construction of the embankment entirely along the north bank of Mud River with no channel modification. The alignment for this plan differs for that portion of the levee east or upstream of Fairground Road bridge. Flood damages to residences and businesses would be reduced, and the cost of flood insurance is avoided. Protection provided by this alternative can vary considerably depending on the height of the levee embankment. A typical levee design which would provide protection against the 1% chance (100-year) flood event has been used for evaluation in the intermediate phase. This plan is estimated to cost \$49.6 (October 2002 price level) million and is marginally feasible. No channel modification is necessary as part of the alternative plan, consequently, environmental impacts are minimized however the community impacts are considerable. This alternative levee alignment was retained for evaluation as a final alternative plan.

A small levee project has been evaluated for the Georgia Avenue residential area. There is little natural high ground in the area, thereby limiting the height of protection to about that of the 1997 flood. The most practical project is a low levee which would extend about 2,200 feet in an arc-like configuration and protect about 25 residences. Providing greater levels of protection would require that the entire area be enclosed within the levee embankment, and this would involve acquisition and removal of several homes along East Mud River Road, the addition of a pump station, and a gate closure. The ring levee design, while protecting nearly twice as many structures, would be much more costly and much more socially disruptive. There would be a danger involved with the ring levee in the event of overtopping. A low Georgia Avenue levee is estimated to cost \$3.1 million (October 2002 price level), including design and construction. Because of the independent utility of the Georgia Avenue levee, it was evaluated as an individual

project that would be required to meet the Corps cost benefit requirements. Flood reduction benefits are insufficient to justify the cost of project construction; therefore, this alternative is not economically feasible and has been dropped from further consideration. (Refer to Table 5-4).

The channel improvement plan originally developed by the NRCS would involve constructing 4,084 feet of new channel as well as widening and deepening of other sections of the stream. The project would have the effect of reducing the 1% chance (100-year) flood event by only 1.7 feet and have even less beneficial effect on a recurrence of the 1997 flood. This channel alternative would result in significant environmental impacts, particularly to aquatic habitat. The maintenance requirements for the modified channel would be a considerable annual cost for the project sponsors. The estimated first cost for the channel plan including design, construction and land acquisition is \$28.5 million (October 2002 price level). While this cost is less than most of the levee alternatives, the benefits from this alternative are much less and insufficient to offset project cost. Consequently, this alternative has been dropped from further consideration (Refer to Table 5-4).

Floodproofing of individual structures within Huntington District has been determined to significantly reduce flood damages. Success is dependant on the physical ability to floodproof structures and the participation of the property owners. If residential structures are sound, they generally can be raised as much as 12 feet. However, many non-residential structures cannot be raised or individually protected in which case the structure would have to be acquired and removed. It is unlikely that all of the businesses would be able to be floodproofed and would be acquired. The floodproofing plan at Milton was based on an estimated 769 residences and non-residential structures, and assumed 100% participation by the property owners. The cost of a floodproofing program with 100% participation is estimated to be \$109.1 million (October 2002 price level), including relocation assistance. This cost greatly exceeds the flood reduction benefits that would result from floodproofing. Therefore, this alternative has been dropped from further consideration. (Refer to Table 5-4).

The alternatives discussed above have been evaluated at the intermediate using estimated benefits, costs and environmental impacts. At least one levee plan along each of two different alignments at Milton is economically feasible and has been retained for further evaluation. A levee at Georgia Avenue, modifications of the Mud River channel and floodproofing at Milton are not economically feasible and have been eliminated. Since various levels of protection can be provided along each alignment, levee plans have been optimized in order to maximize net benefits. A summary of the intermediate screening of alternatives is provided in Table 5-4. In the next section, optimization of the various levee plans at Milton is discussed.

Table 5-4
Intermediate Screening of Alternatives

Alternative Plan	First Cost (Oct 02 PL)	Annual First Cost (Oct 02 PL)	Effectiveness	Annual Benefits	Net Benefits	Benefit Cost Ratio	Environmental Impact	Social and Community Impacts	Conclusions
Levee with channel modification	\$37.48 M	\$2.42 M	Highly Effective (1% chance flood)	\$3.27 M	\$0.85 M	1.3	Major. 4084 ft. of new channel	Moderate	Retained. Efficient Alternative
Levee along river bank	\$49.64 M	\$3.20 M	Highly Effective (1% chance flood)	\$3.28 M	\$0.07M	1.0	Moderate	Major. Impacts several businesses & residences	Retained. Environmentally Preferred Alternative
Georgia Ave. Levee	\$3.06 M	\$0.20 M	Low Effectiveness	\$0.06 M	(0.13 M)	0.3	Minor	Minor	Dropped. Not economically feasible
Mud River Channel Modification	\$28.47M	\$1.84 M	Low Effectiveness	\$1.40 M	(0.44 M)	0.8	Major. 2.8 miles of channel modification	Minor	Dropped. Not economically feasible
Flood Proofing	\$109.1M	7.04 M	Highly Effective ₁	\$3.59 M	(3.46 M)	0.5	Minor	Major. Business Disruption	Dropped. Not economically feasible

₁ Effectiveness depends on the participation of owners

5.4.3 Optimization of Levee Plans

Results of intermediate screening indicated that the most feasible alternatives for reducing flood damages at Milton are levees along each of two different alignments. Typical levee designs were evaluated along both alignments, and both were determined to have economically feasible plans. There are different levee heights, both higher and lower than the designs which have been evaluated in the intermediate phase. The following sections summarize the optimization of levee plans in order to maximize net benefits.

5.4.3.1 Levee with Channel Section

The plan evaluated for intermediate screening was a levee that would protect against the 1% chance (100-year) flood event. This is the level of protection which the Corps traditionally evaluates for an urban area and also meets FEMA guidelines for the National Flood Insurance Program. This levee would be approximately 7,900 feet in length, and includes a new section of river channel to replace approximately 4,084 feet of natural channel impacted by project construction. Most of the area between the old and new channels would be used for ponding of interior drainage and for developing mitigation measures. The levee plan to protect against the 1% chance (100-year) flood event is estimated to cost \$37.5 million (October 2002 price level). The plan has considerable net benefits and benefit-to-cost ratio of 1.3.

To determine the potential feasibility of a very high project, a levee providing protection against a 0.2% chance (500-year) flood event was evaluated. This levee plan would have essentially the same alignment as the lower levee (1% chance (100-year) flood event), but would be approximately 8,200 feet in length. The additional length results because at the upstream end the levee must extend about 300 feet north of US 60 to reach high ground. The top of the levee is approximately 5 feet higher than the design for the lower levee, resulting in an increase in embankment of 170,000 cubic yards (40%). The pumping requirements for interior drainage are the same, but a highway closure for US 60 is required at the upstream end. The cost for a levee with very high level of protection is estimated to be \$41.2 million (October 2002 price level). This levee plan is economically feasible and the net benefits are approximately equal to that for the lower levee plan. (Refer to Table 5-4).

Since levees providing both moderate level of protection 1% chance (100-year) flood event and very high level of protection (500-year frequency) were economically feasible with both providing similar net benefits, various levee heights between these two plans were evaluated in order to maximize net benefits. Plan benefits were estimated at 0.5 feet increments from the 1% chance (100-year) flood event (elev 593.6) up to the 0.2% chance (500-year) flood event (elev 598.5). Venture level cost estimates had been completed for these two levee plans, and estimated costs for various heights in-between were developed on a prorated basis. The results of the evaluation indicated that the greatest net benefits were generated for a levee project with a protection level of approximately 0.4 % chance (250-year) flood event. More detailed costs were then developed for this alternative. Pertinent data for levee plan optimization are summarized in Table 5-4, and details for the complete optimization exercise are provided in the Economic Appendix to this report.

5.4.3.2 Levee Along River Bank

A levee extending along the north bank of Mud River which could protect against the 1% chance (100-year) flood event initially was evaluated. This plan meets FEMA requirements and no channel modification is necessary. This levee would be approximately 8400 feet in length, and requires a large pump station at Johns Branch. The plan providing protection against the 1% chance (100-year) flood event is estimated to cost \$49.6 million (October 2002 price level), about one-third of which is for the pump station at Johns Branch. As a result of the high cost for the pump station this plan is only marginally feasible. Recognizing that reducing the pump station cost would result in a more economical plan, several other options were considered. The most cost effective plan is for the levee to begin west of Johns Branch, eliminating the need for that large pump station. There is no naturally high ground south of US 60, consequently, the protection level would be low, only about that of the 1997 flood (20+/- year frequency). The property protected by this plan is considerably less than for the higher protection (1% chance (100-year) flood event), but the plan is economically feasible with a benefit-to-cost ratio of 1.3. This plan is estimated to cost \$27.6 million (October 2002 price level).

To determine if a very high levee along this alignment was feasible, a plan providing protection against the 0.2% chance (500-yr) flood event was evaluated. This levee would be 5 feet higher than the 1% chance (100-year) flood event plan and include a large pump station at Johns Branch. The estimated cost of this plan is \$58.2 million (October 2002 price level) and it is not economically feasible.

5.4.3.3 Summary of Levee Optimization

Protective levees along two different alignments were determined to be the most feasible alternatives at Milton. For the levee alignment involving channel modifications, three different levels of protection have been evaluated. These are designated Plan A – moderate (1% chance flood event); Plan B – high (0.4% chance flood event); and Plan C – very high (0.2% chance flood event). The estimated net benefits for Plan A (moderate) and Plan C (very high) are approximately the same. The net benefits for Plan B (high) are slightly larger; consequently, it is the optimum plan for this levee alignment. (Refer to Table 5-5).

For the levee alignment along the north river bank, three different protection levels have been evaluated. Two levee plans designated Plan E - Moderate, and Plan F – High, have comparable levels of protection to plans for the other levee alignment. The third option, designated Plan D, provides a much lower level of protection, but is cost effective since a large pump station at Johns Branch is not required. The cost for Plan D is about one-half that of other plans for this alignment and has much greater net benefits. Consequently, Plan D is the optimum plan for this alignment.

Plans A-C all are economically feasible, although all involve channel modifications resulting in significant environmental impacts. Plan B has the greatest net benefits, therefore it is designated the NED plan and has been retained as a final alternative plan. Plan D has the greatest net benefits for levees along the river bank alignment. This is the environmentally preferred plan since no channel modifications are necessary. The protection level of Plan D is much lower than any of the other plans evaluated, and the

residual damages are much greater. Nevertheless, Plan D is considered a viable option and has been retained as a final alternative plan. A summary of levee optimization is provided in Table 5-5.

5.4.4 Final Array of Alternatives

Based on previous analysis, only two basic alternatives for reducing flood damages at Milton were determined to be economically feasible. These alternatives are flood protection levees with two different alignments along Mud River. The optimum plan along each alignment has been determined, and these have been designated Plan B- 250-year frequency with channel modification and Plan D – 20-year frequency along north river bank. Both of these alternative plans have been determined to be, acceptable to the local sponsor and capable of implementation. These levee plans have been developed with more detailed information, and in this section are further discussed and compared with No Federal Action or the “Without Project” condition. With the availability of more detailed engineering data, the cost estimates for the final plans have been revised to the baseline level. The evaluation and comparison of the final alternative plans with no action are summarized in Table 5-16.

5.4.3.1 Levee with Channel Modification (Plan B)

Plan B is an earthen levee that would protect most of Milton including the business district from flooding up to the 250-year frequency level. The levee would begin at the eastern edge of Milton, extend from US 60 south and then west about 2,000 feet crossing Mud River, then continuing west another 2,000 feet and crossing Mud River again before reaching Mud River Road bridge, then generally west about 2,200 feet along the north river bank to Newmans Branch, and finally west about 2,100 feet along the river bank to high ground south of US 60 near Abbot Road Junction. The total length of the levee is approximately 8,300 feet, with about 4,084 feet of new Mud River channel. This alignment allows construction of a section of levee across bottomland such that several businesses and residences along the riverbank would not be impacted. The area between the existing channel and the new levee embankment, approximately 13 acres, would be used for ponding of interior damage, thereby reducing the pumping requirement so that a pump station of only 30,000 GPM is required for Johns Branch. A pump station of similar size is required for Newmans Branch.

The levee embankment would have a 10-foot top width and slopes of 2.5 to 1. The levee would average 19 feet in height, with the highest section being approximately 26 feet. The levee would have a solid core, requiring approximately 364,000 cubic yards of impervious material for the embankment. The construction material would come from excavation of the new section of channel and from a borrow site just south of the channel construction area. Construction of the levee would require the acquisition of 1 businesses and 6 residences. A stoplog emergency gate closure would be required on Mud River Road just north of the bridge over Mud River. This levee plan would provide flood protection up to the 0.4% chance (250-year) flood event, for an estimated 696 residences, businesses, and public buildings.

**TABLE 5-5
LOWER MUD RIVER- MILTON LPP
OPTIMIZATION OF LEVEE PLANS**

Alternative Plan	First Cost (Millions) Oct 02 PL	Annual Cost (Millions) Oct 02 PL	Annual Benefits (Millions) Oct 02 PL	Net Benefits (Millions) Oct 02 PL	Benefit- Cost Ratio	Environmental Impacts	Social and Community Impacts	Conclusions
Levee Alignment with Channel Modification								
Plan A Moderate Level (1% Chance Flood)	\$37.48 M	\$2.42 M	\$3.27 M	\$0.85 M	1.3	Major. 4084' New channel	Moderate Impacts 1 Businesses, & 6 Residences	
Plan B High Level (0.4% Chance Flood)	\$38.66 M	\$2.72 M	\$3.45 M	\$0.073 M	1.3	Major. 4084' New channel	Moderate Impacts 1 Businesses, & 6 Residences	NED Plan
Plan C Very High Level (0.2% Chance Flood)	\$41.19 M	\$2.66 M	\$3.51 M	\$0.85 M	1.3	Major. 4084' New channel	Moderate Impacts 1 Businesses, & 6 Residences	
Levee Along River Bank								
Plan D Low Level (5% Chance Flood)	\$27.56 M	\$1.94 M	\$2.30 M	\$0.036 M	1.2	Minor	Major. Impacts 6 Businesses, 29 Residences	Environmentally Preferred Plan
Plan E Moderate level (1% Chance Flood)	\$49.64 M	\$3.20 M	\$3.28 M	\$0.07 M	1.0	Moderate	Major. Impacts 6 Businesses & 29 Residences	
Plan F Very High Level (0.2% Chance Flood)	\$58.19 M	\$3.76 M	\$3.45 M	(\$.31M)	0.9	Moderate	Major. Impacts 6 Businesses & 29 Residences	Not Economically Feasible

Construction of this plan impacts approximately 4,084 feet of existing channel upstream from the Mud River Road bridge. A new section of naturally designed channel, approximately 4,084 feet long, would be located South of the existing channel. The area on either side of the levee between the old and new channels would be developed as part of a mitigation plan to offset the loss of riparian habitat and wetlands impacted by stream channel modifications. The plan would involve maintaining one bank of the old channel, developing wetlands in the area to be used for ponding, and planting of riparian and bottomland vegetation. A summary comparison of Plan B and Plan D with the No Action is provided in Table 5-16.

5.4.3.2 Levee Along River Bank (Plan D)

Plan D is an earthen levee that would protect a substantial portion of Milton, including most of the main business district, from flooding up to the 5% chance (20-year) flood event. The levee would begin just west of Johns Branch and south of US 60, then continue generally west for approximately 2,700 feet to Mud River Road bridge, then west for approximately 4000 feet crossing Newmans Branch to high ground south of US 60 near Abbot Road junction. The total length of this levee is approximately 6,700 feet, and no modification of Mud River channel is necessary. The levee embankment would have a 10-foot wide top and slopes of 2.5 to 1. The levee would average about 9 feet in height with the highest section being about 18 feet. The solid core levee would require approximately 123,000 cubic yards of impervious material for construction of the embankment. The construction material would come from a large borrow area located south of Mud River and east of the Mud River Road bridge. A 30,000 GPM pump station would be required to remove internal drainage from Newmans Branch, and another 45,000 GPM pump station is necessary to remove interior drainage from the Perry Morris Square area. Construction of the levee would require the acquisition of 6 businesses, and 29 residences. The plan would provide flood protection to the 5% chance (20-year) flood event or about the level of the 1997 flood. Higher protection cannot be provided without the need for a very large pump station at Johns Branch, which more than doubles the cost of this levee project. The environmental impacts of this plan are minimal, since no modification of Mud River channel is necessary. A summary comparison of Plan B and Plan D with the No Action is provided in Table 5-16 at the end of section.

5.4.4.3 No Federal Action

The without project condition assumes no action by the Federal government to implement any type of comprehensive flood damage reduction program at Milton. It reflects the continuation of existing economic, social, and environmental conditions and trends in the project area. Inherent with this condition would be federally subsidized flood insurance coverage for property owners that is currently available through the National Flood Insurance Program and continued enforcement of the local floodplain management ordinances. This condition would result in no expenditure of federal funds to implement a flood damage reduction plan for the City of Milton. However, federal expenditures to subsidize the flood insurance program and to assist in flood emergency and recovery operations would continue.

The potential for future growth and economic development in Milton would be somewhat limited without the means to reduce damages from major floods. It can be expected

that the residents of Milton would continue to be subjected to floods and flood damages similar to what has occurred in previous years. The residential and business district would continue to deteriorate and business owners would be left to cover continually increasing flood losses on an individual basis. Flood insurance now available for floodplain occupants, while providing some economic protection, does not necessarily guarantee a decent, safe and sanitary community environment. A summary comparison of Plan B and Plan D with the No Action is provided in Table 5-16.

5.5 ENVIRONMENTAL CONSEQUENCES

This section discusses the environmental effects, adverse environmental effects that cannot be avoided, the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity, and irreversible and irretrievable commitments of resources from implementation of the two final alternatives. In addition, measures to mitigate adverse environmental impacts are also discussed.

5.5.1 Land Use/Land Cover

This section discusses the potential effects of the Milton flood control alternatives on the land use and land cover of the project area. The methodology for determining impacts is presented, along with a description of the impacts for each alternative.

Methodology

The land use/land cover resource impact analysis consists of an evaluation of the effects caused by the construction and operation of potential project alternatives on specific land within the contractors work limits. These impacts are evaluated based on the classification of land use types defined in Section 4.1.

To determine if an action may cause a significant impact, both the context of the proposed action and the intensity of the impact are considered. The context for a Lower Mud River flood control project is the vicinity of Milton. The intensity of the impact is considered in terms of any unique characteristics of the area and the degree to which the considered action may adversely affect such unique resources. The land use evaluation includes both temporary land use impacts during construction and permanent changes to land use resources resulting from the project.

Land Use / Land Cover Impact from the No Action Alternative

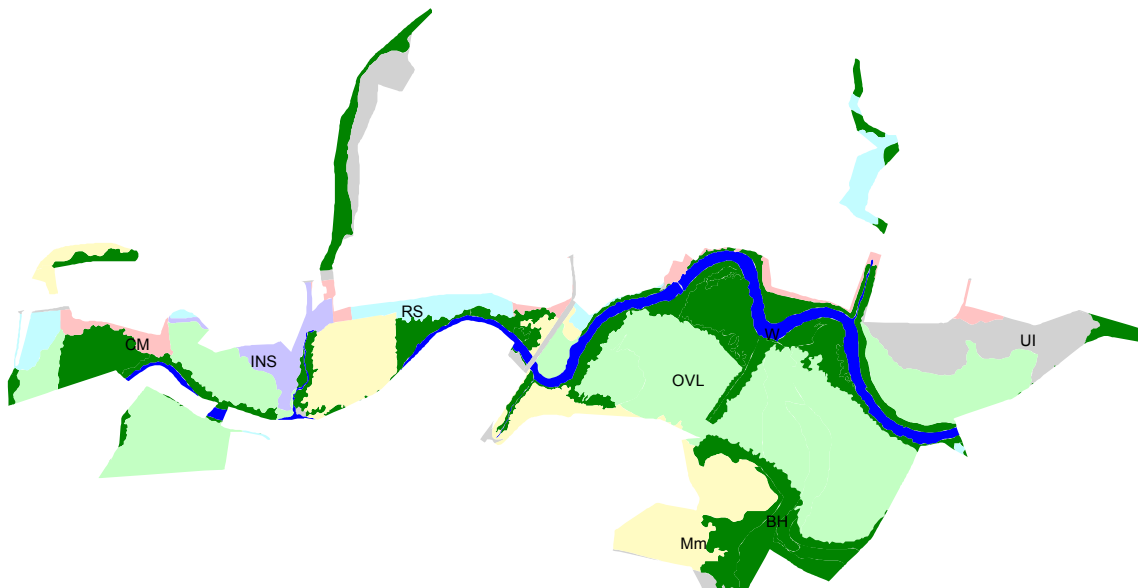
Under the No Action Alternative, potential impacts to land use/land cover associated with the construction and operation of a Milton flood control project would not occur. Given that flooding would continue in the community in the future, change in land use could be expected due to structural damages and deterioration of buildings. The continued potential for flooding of residences and commercial establishments within Milton could tend to discourage investment in new construction, building maintenance and improvements.

Land Use / Land Cover Impacts from Plan B

The Construction Work Limits (CWL) for Plan B levee plan with channel relocation includes approximately 172 acres. The levee alignment would be approximately 8,312

feet long, would have an average height of 19.0 feet and would be about 26 feet high at its highest point. The permanent flood control infrastructure would encompass approximately 21.5 acres of the 172 acre CWL. Land use and land cover types, as defined in Section 4.1 consists of approximately 3% Commercial, 27% Forest, 2% Institutional, 13% Maintained, 37% Open Vegetated Land, 5% Residential, 18% Urban Industrial and 5% Water Resources. Refer to Figure 5-9.

Figure 5-9. Land Use Impacts for Plan B



Residential – RS
Commercial – CM
Institutional – INS
Forested – BH

Open Vegetated Land – OVL
Urban/Industrial – UI
Maintained - Mm
Water - W

The levee alignment begins on the southern embankment of U.S. Route 60, approximately 1,350 feet east of the Johns Branch Road and U.S. Route 60 junction. The levee follows the northern Mud River embankment for approximately 300 feet before it heads in a south westerly direction and crosses what is now a borrow area for aggregates.

The levee alignment extends through one commercial property approximately 460 feet from inception. The majority of this area is highly disturbed. Approximately 6 residences would be removed for the project construction. The aggregate borrow area in certain sections is approximately the same elevation of the Mud River and consequently creates an open water feature that provides suitable habitat for many species commonly associated with riverine habitats.

The levee alignment would cross Mud River approximately 2000 feet from the southern embankment of U.S. Route 60. The levee would continue westward and cross open

vegetated land that is currently used as agricultural and parking for the annual Milton Pumpkin festival.

Because of interior drainage from the levee's intersection with Johns Branch, a 30,000 gallon per minute (gpm) pump station and gatewell would be constructed to enable the interior runoff to be removed from the ponding area in the event that a significant rain occurs. Flowage easement for the approximately 13 acres would be acquired to maintain a ponding area. Therefore, future use of this land would be restricted, as no structures could be built within the easement limits.

The levee alignment continues westward and again crosses the Mud River and ties into the north side of the Mud River Road Bridge. In order to provide positive cutoff at this location a gate closure would be constructed across the highway to a height of 6.4 feet and a width of 33 feet. The levee then follows the northern bank of the Mud River opposite the Milton sanitary lagoons. The levee continues to follow the river bank in a south westerly path across an existing go cart track and terminates at Abbott Street.

Plan B requires that a new river channel approximately 4,084 feet in length be constructed to replace the 4,084 linear feet of Mud River channel that is impacted by the levee embankment or is inside the line of protection.

The usable material excavated from the construction of the new section of river channel, from two ponding areas, and from a borrow area located just to the north of Super Value, will be utilized in the construction of the levee embankment. Temporary storage areas for equipment and materials would be located within the CWL.

The land use impacts on staging areas would be temporary, as these areas would return to open land after construction. The soil borrow areas at the confluence of Johns Branch and Newmans Branch and the Mud River could be used for mitigation of wetland and terrestrial habitat losses under Plan B.

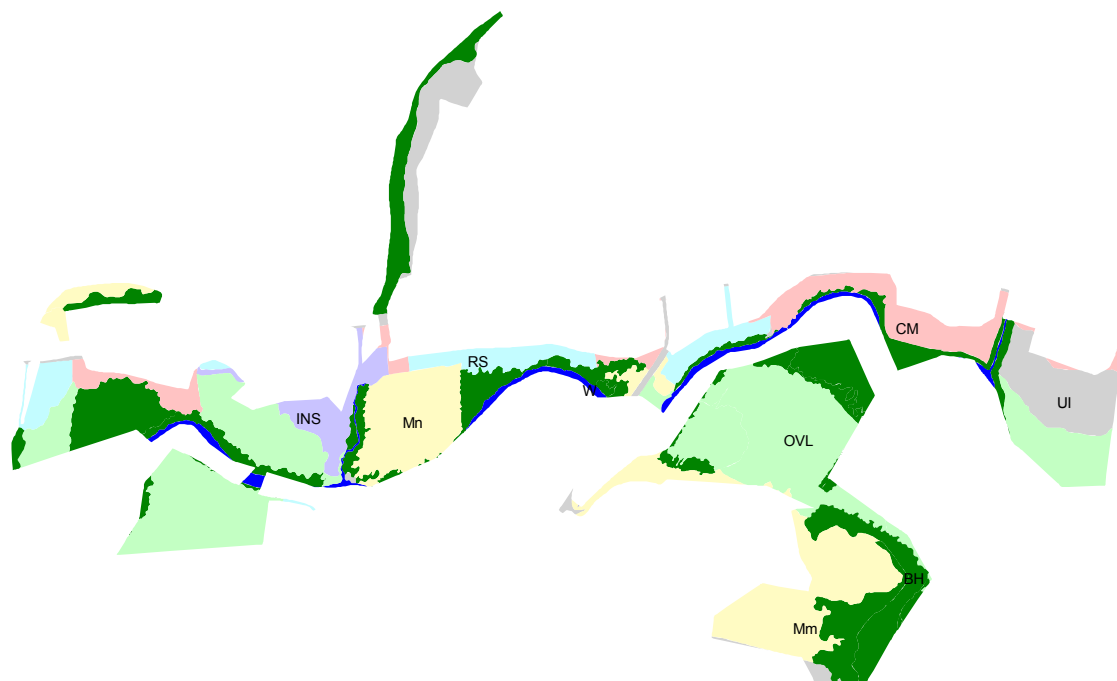
Upon completion of construction of Plan B, the land not part of the levee system that was affected during construction would return to its pre-construction condition, with the exception of the borrow areas and new river channel area. Mitigation for terrestrial losses could include plantings and natural succession. Coordination with appropriate Federal and state agencies has occurred and will continue throughout completion of the project. Those areas between the levee and streams acquired as part of the project would be turned over to the sponsor with restrictive covenants in the deeds. These restrictions will ensure that these valuable riparian habitats would be protected and improve over time. Access to streams from the river and creek banks would be hindered by the levees from the area north of the levee.

In evaluating the significance of the land use impacts of Plan B, both context and intensity are considered. The relatively small residential and commercial size of Milton, the urban area affected may be considered moderately impacted; however, future development within the flood-protected area would be expected. The impacts to the Cabell County Fair and Pumpkin Festival parking area is considered significant, given its importance to the community. The recreational use of the Milton Little League Fields would not be impacted under Plan B. (Refer to Section 5.5.10)

Land Use / Land Cover Impacts from Plan D

The land use/land cover impacts on the Milton side of the project (north of the Mud River) from Plan D would be the same as those for Plan B with the following exceptions: this alternative requires no highway gate closures, includes a 30,000 gpm pump station for Newmans Branch interior drainage area, and a 45,000 gpm pump station for Perry Morris Square drainage area, and no modification of the Mud River channel. The land use/land cover impacts within the CWL of Plan D would be 119 acres. This area consists of approximately 7% Commercial, 24% Forest, 3% Institutional, 19% Maintained, 30% Open Vegetated Land, 6% Residential, 9% Urban/Industrial and 2% Water. Refer to Figure 5-10.

Figure 5-10. Land Use Impacts for Plan D



Residential – RS
Commercial – CM
Institutional – INS
Forested – BH

Open Vegetated Land – OVL
Urban/Industrial – UI
Maintained - Mm
Water - W

Plan D levee starts approximately 25 feet south of the southern edge of U.S. Route 60 and 75 feet west of Johns Branch. The levee extends in a southerly direction between the Milton Plaza and Johns Branch, then parallels Johns Branch for approximately 300 feet and then turns to the west behind the Milton Plaza. The levee then extends along the northern bank of the Mud River. The levee would require the removal of 6 businesses and 29 the residences south of Damon Street as it continues along the northern bank of the Mud River. The levee would then tie to high ground on the eastern approach to the Mud River Road Bridge. The levee extends in a westerly direction from Mud River Road Bridge following the northern bank of the Mud River. The levee

continues in a south westerly direction and crosses an existing privately owned go cart track. The levee then crosses the former Covered Bridge approach and continues in a westerly direction along the northern bank of Mud River to high ground on the west side of Abbot Street.

The land impacted by Plan D levee would be similar to that for Plan B except the levee would extend along the north bank of the Mud River the entire course and there would be no channel modification. The staging and soil borrow areas identified for Plan B would also be utilized for Plan D, with the exception that no borrow material will be used from the open/agricultural lands.

The land use impacts under Plan D would be the same as under Plan B for land adjacent to the Mud River except that significantly more urban area will be used for the footprint of the levee. Residential and businesses could be significantly impacted. The parking area for the Cabell County Fair and Pumpkin Festival would be temporarily impacted during construction, but would not be permanently impacted. The go-cart track would be permanently impacted in that the levee footprint will cover the track. The Milton Little League ball fields would not be impacted. In contrast to Plan B, there would be no impacts for Plan D associated with the modification of the Mud River. As with Plan B, future development within the flood-protected area would be expected.

5.5.2 Topography / Drainage

This section discusses the potential effects of the Milton flood control project on the topography and drainage in the project area. Impacts to the large surface water bodies in the area are discussed primarily in Section 5.5.6, Surface Water/Floodplain Management. The methodology for determining impacts is presented, followed by a description of the impacts for each alternative.

Methodology

The topography/drainage impacts analysis considers a region of influence that includes the areas that would be affected by construction and operation of each alternative. These areas include the levee footprint; stream and riverbanks along the levee; the soil borrow area; new channel location, and the staging areas. Impacts were determined by assessing potential changes in existing topography and drainage patterns that could result from construction activities and operations under each alternative.

Topography / Drainage Impacts from the No Action Alternative

The Mud River is a fairly stable river but does show signs of active aggradation and degradation. Bank erosion is extensive in some areas. No impacts to topography would occur from No Action and local drainage patterns would remain unchanged. Similarly, the topography/drainage of the soil borrow areas and staging areas would remain unchanged.

Topography / Drainage Impacts from Plan B

Mud River

The Mud River is a low gradient river dropping approximately 9 inches from the east end to the west end of the project. Because of the low gradient, there is an under-development of riffle/pool complexes. The banks of the Mud River are typically stable and turbidity appears to be pervasive throughout the watershed. The riparian corridor is narrow due to encroachment of development of both commercial and residential properties. The new section of channel will be the same length as the existing channel with about the same gradient. However, between the levee and along both sides of the new channel, the area would be restricted from development therefore, increasing the riparian corridor from an average width of 50 feet to an average width of 250 feet.

Soil Borrow Area

The topography and drainage characteristics of the Johns Branch soil borrow/ponding area would be altered significantly, as up to approximately 5 feet of material would be removed between the existing river channel and used in the construction of the levee embankment. The majority of embankment material for the project will come from the 15.21 acre borrow area located behind Super Value and the construction of the new channel. The maximum elevation change at the borrow site behind Super Value would be 22 feet.

Staging Areas

The topography and drainage characteristics of the staging areas would not be altered significantly, and would be restored to the original grade after construction is finished. Soils could be compacted by heavy equipment movement in these areas. However, after construction is complete these areas would be vegetated and therefore some soil preparation would be required.

Interior Drainage

The levee structures for Plan B would impact the drainage of surface runoff to the Mud River. The levee alignment would require pump stations at both Johns and Newmans Branches to discharge interior drainage to the river. The pump sizes vary from 45,000 gpm at Johns Branch to 30,000 at Newmans Branch.

Topography / Drainage Impacts from Plan D

Mud River

The topography/drainage impacts that would occur to the Mud River and Newmans Branch under Plan D are the same as described above for Plan B except there is no channel relocation and there is interior drainage structures required at Johns Branch. However, from the Mud River Road Bridge and west, the drainage and topography is nearly the same. At Perry Morris Square, a 45,000 gpm pump will be utilized due to interior drainage. There will not be any highway closures.

Soil Borrow Area

The topography and drainage impacts to this area would be the same as described above for Plan B in the borrow area behind Super Value. The maximum elevation change for the borrow area is 22 feet. There will not be any soil borrow from the open agricultural fields.

Staging Areas

The impacts to topography and drainage of the staging areas would be the same as described above for Plan B.

Interior Drainage

To remove interior drainage, a 45,000 gpm pump will be utilized at Newmans Branch and a 30,000 gpm pump will be utilized at Perry Morris Square shopping area. There will not be any highway closures.

5.5.3 Geology and Soils

This section discusses the potential effects of the Milton flood control project on the geology and soils in the project area. The methodology for determining impacts is presented, followed by a description of the impacts for each alternative.

Methodology

The geology and soils impacts analysis considers a region of influence that includes the areas that would be affected by construction and operation of each alternative. These areas include the levee footprint and construction CWL; stream and riverbanks along the levee; the soil borrow area; the staging areas; and channel relocation. Impacts were determined by assessing potential changes in existing geology and soils that could result from construction activities and operations under each alternative. In addition, potential impacts from geologic hazards are evaluated.

Geology and Soils Impacts from the No Action Alternative

With No Action Alternative, there would be no impacts to the geology and soils of the other potentially affected areas, as no construction for flood control measures would occur under the No Action Alternative. The potential for geologic hazards would remain as described in Section 4.1.3.

Geology and Soils Impacts from Plan B

Prime Farmland Soils

Most of the soils in the open agricultural designated area of the project are fertile floodplain soils that are classified as prime farmland soils. However, because of the developed nature of most of the project area, many of these soils have been disturbed or are located adjacent to disturbed, developed areas. Typically, most farmland competes with urban sprawl in the Teays Valley. The agricultural fields in the vicinity of the channel relocation are located in the floodplain and would not be developed for urban

uses unless there is filling in the flood plain. One agricultural site is also used during the annual Cabell County Fair and Pumpkin Festival as a main parking area.

Mineral Resources

Other than soil, there are no viable mineral resources in the project area; therefore, no impacts to mineral resources would be expected.

Erosion

During construction, soil disturbance would occur along the levee embankment, at staging areas, at soil borrow sites, at the new channel location and during construction of the haul road. These activities would destroy soil profile, leading to a possible temporary increase in erosion as a result of stormwater runoff and wind action. Standard Corps erosion control methods would limit soil loss and transport of eroded soil. Erosion control methods that could be utilized during construction include, but are not limited to, straw bales, silt fence, temporary vegetation and silt curtains.

Geologic Hazards

No geologic hazards have been identified in the project area that would affect construction or operation of Plan B. Seismic risk is considered to be low and ground rupture as a result of an earthquake is unlikely.

Geology and Soils Impacts from Plan D

The impacts to geology and soils from Plan D would be generally the same as described above for Plan B, with the following exceptions.

There would be a lesser impact to the geology and soils from Plan D due to the smaller footprint of the levee and because there will not be any channel relocation. In order to construct the levee, approximately 380,000 cubic yards will be utilized from the borrow area behind Super Value.

5.5.4 Air Quality and Climate

This section discusses the potential effects of the Milton flood control project on the air quality and climate of the project site and other potentially affected areas. The methodology for determining impacts is presented, followed by a description of the impacts for each alternative.

Methodology

The air quality and climate impacts discussion focuses on the construction phase of the project as the primary activity with the potential to impact air quality. This evaluation includes potential air emissions during construction of each alternative from two sources: 1) construction vehicle exhaust, and 2) fugitive dust due to site disturbance. Quantification of emissions is based upon projected construction progression, equipment use, dust control procedures, and local climate and soil conditions. Mitigation measures

to avoid potential nuisance dust conditions and minimize construction equipment impacts to nearby residents are described below.

Air Quality and Climate Impacts from the No Action Alternative

Under the No Action Alternative, potential air quality impacts associated with the construction and operation of the Milton flood control project would not occur. The air quality and climate impacts of the No Action Alternative would be the same as the existing Air Quality and Climate affected environment discussed in Section 4.1.4.

Air Quality and Climate Impacts from Plan B

The duration of construction for Plan B is projected to last three to four years. The major contributors to potential adverse impacts to air quality would be construction vehicle exhaust and fugitive dust emissions (dust which escapes from a construction site) from construction vehicles and soil handling. No impact to overall climate would be expected as a result of Plan B given the localized and temporary nature of the potential effects.

Several factors affect the amount of fugitive dust emissions from an active construction site. The size of the construction site(s), soil type, level of activity, and specific operations being performed affect the generation of fugitive dust. Dust control practices (e.g., watering of construction areas) and prevailing meteorological conditions will be utilized to minimize the release of fugitive dust emissions.

The fugitive dust emissions from construction of Plan B would be approximately 4.7 tons/year. These calculations assume a typical speed of 15 mph. The calculations account for the mitigation effects of standard Corps procedures (Corps of Engineers Technical Manual TM 5-830-03) to water disturbed surface areas in an amount and frequency to control fugitive dust. The average duration for an active construction area near a particular residence or business would be 1-2 months. Fugitive dust emissions from active construction areas would result in temporary localized adverse impacts to air quality.

The use of construction equipment would result in the emission of air pollutants associated with diesel combustion. The major pollutants emitted would be nitrogen oxides (NO_x), carbon monoxide (CO), sulfur oxides (SO_x), particulate matter (PM₁₀) and hydrocarbon gases (ROG) from the fuel. The Corps' estimate of major construction equipment use is as follows: 10 generators, 3 end loaders, 6 scrapers, 2 graders, 8 dump trucks, 3 rollers/compactors, 3 cranes, 2 water trucks, 6 dozers and 3 excavators. Based upon construction equipment estimated annual construction emissions are shown in Table 5-6.

Table 5-6
Estimates of Yearly Construction Emissions for Plan B

<u>Emission Source</u>	<i>Plan B Emissions (tons per year)</i>				
	<u>ROG</u>	<u>NO_x</u>	<u>CO</u>	<u>SO_x</u>	<u>PM₁₀</u>
Construction Equipment	1.46	17.89	3.85	1.18	1.21
Fugitive Dust	0	0	0	0	3.5
TOTAL	1.46	17.89	3.85	1.18	4.7

Source: EPA 1991 and EPA 1995

The construction emissions of Plan B would not be expected to affect EPA's designation of the Milton area as in attainment with the NAAQS for criteria pollutants (see explanation in Section 4.4.2). The construction vehicle emissions would generally be localized and temporary in nature. The use of modern and properly maintained construction equipment, and controlled refueling procedures would minimize air quality impacts from construction equipment. A discussion is presented in Section 5.5.13 of potential air quality related health effects.

Upon completion of construction, little or no air impacts are expected from ongoing operation and maintenance of the flood protection project to be carried out by the City of Milton. The diesel engines of the pump station would have minor emissions, however these would run only during flood events and therefore impacts would be minor and temporary. Emissions would be expected from an occasional maintenance vehicle required to perform maintenance activities and these would be minor.

Air Quality and Climate Impacts from Plan D

Under Plan D, the potential sources of air quality impacts would be the same as those under Plan B. The three to four year construction period for Plan D is the focus of the air quality impact analyses as the primary activity likely to generate air quality effects. Due to the decreased amount of construction activity under Plan D, Plan D projected emissions are slightly lower than those from Plan B.

Plan D would likely involve the use of several construction sites concurrently. As construction of the levee progresses, the impacts of air quality would follow the active construction areas. No impact to overall climate would be expected as a result of Plan D given the localized and temporary nature of the potential effects.

The use of construction equipment would result in the emission of air pollutants associated with diesel combustion. The major pollutants emitted would be nitrogen oxides (NO_x), carbon monoxide (CO), sulfur oxides (SO_x), Particulate Matter (PM₁₀) and hydrocarbon gases (ROG) from the fuel. Estimated major construction equipment use is as follows: 10 generators, 3 end loaders, 6 scrapers, 2 graders, 3 dump trucks, 3

rollers/compactors, 3 cranes, 2 water trucks, 6 dozers and 3 excavators. Based upon construction equipment, annual construction emissions are shown in Table 5-7.

Table 5-7
Estimates of Yearly Construction Emissions for Plan D

<u>Emission Source</u>	<i>Plan D Emissions (Tons per year)</i>				
	<u>ROG</u>	<u>NO_x</u>	<u>CO</u>	<u>SO_x</u>	<u>PM₁₀</u>
Construction Equipment	1.19	14.63	3.15	0.96	0.99
Fugitive Dust	0	0	0	0	1.32
TOTAL	1.19	14.63	3.15	0.96	2.31

Source: EPA 1991 and EPA 1995

The construction emissions of Plan D would not be expected to affect EPA's designation of the Milton area as in attainment for the NAAQS for criteria pollutants (see explanation in Section 4.4.2). The construction vehicle emissions would generally be localized and temporary in nature. The use of modern and properly maintained construction equipment, and controlled refueling procedures would minimize air quality impacts from construction equipment. A discussion is presented in Section 5.5.13 of potential air quality related health effects.

Given the logistical constraints on daily construction operations, construction emissions from Plan B and D are projected to be similar on a yearly basis. Both alternatives are estimated to be completed within a three to four year timeframe.

5.5.5 Noise

This section discusses the potential noise impacts of the Milton flood control project from construction activities and operation in the potentially affected areas. The methodology for determining impacts is presented, followed by a description of the impacts from each alternative.

Methodology

The analysis of noise impacts focuses on the potential effects of the construction and operation of each of the proposed alternatives on the background noise levels in the Region of Influence (ROI). The analysis includes quantification of projected noise levels during construction generated by construction activities for both alternatives. The post-construction noise impacts of each alternative are also identified.

In determining the significance of the calculated Day-Night Average Sound Level (DNL), results for each alternative are compared to established standards. In 1974, the EPA identified noise levels that could be used to protect public health and welfare, including prevention of hearing damage, sleep disturbance, and communication disruption. Outdoor DNL values of 55 dBA were identified as desirable to protect against activity interference and hearing loss in residential areas and at educational facilities.

The determination as to whether the impact of a single sound event (or series of single events) is significant is a qualitative assessment of the increase in noise level above background as experienced by receptors near the source. A subjective response to changes in sound levels based upon personal judgments of sound presented within a short time span indicate that a change of +/-5 dBA may be quite noticeable, although changes that take place over a long period of time of this magnitude or greater may be “barely perceptible.” Changes in sound levels of +/-10 dBA within a short time span may be perceived by humans as “dramatic” and changes in sound levels of +/-20 dBA within a short time span may be perceived as “striking.” In qualitative terms, these types of changes in sound level could be considered significant (DOE 2001).

Noise Impacts from the No Action Alternative

Under the No Action Alternative, potential noise impacts associated with the construction and operation of the Milton flood control project would not occur. The local noise conditions would continue as they currently exist. Natural sounds, such as from the streams and wildlife, along with any local traffic or construction sounds would be the dominant sources of noise. Based on the population density and activity of Milton, the current background noise level is estimated to be approximately 30 dBA. This level would not change appreciably under the No Action Alternative (Canter 1977).

Noise Impacts from Plan B

The acoustical environment would be impacted during construction of Plan B. Construction activities would generate noise produced by heavy construction equipment, trucks, and to a lesser extent power tools, used within the CWL. Relatively high peak noise levels in the range of 93-108 dBA would occur on the active construction sites, decreasing with distance from the construction areas. Noise levels would be variable and intermittent, as equipment is operated on an as-needed basis. Construction activities normally would be limited to daytime hours, and thus would not impact existing background noise levels at night.

Plan B would likely be constructed in one phase with several sites under active construction concurrently. As construction of the levee progresses, potential noise impacts would follow the active construction areas. Construction for Plan B is projected to last three to four years.

Single event exposure. Table 5-8 presents the peak noise levels (dBA) expected from various construction equipment during the proposed construction of Plan B.

The potential noise impacts under Plan B would be most severe to residences, businesses, and the middle school that are located adjacent to the river. The river banks define the boundaries of several properties throughout the communities, while many more properties are located at distances of 50 feet, 100 feet, or more. The combined effect of several equipment types operating simultaneously is not represented by the sum of the individual noise levels, but rather is calculated based on the logarithmic scale of decibels (see explanation in Section 4.5). Table 5-9 presents the results of a sample calculation assuming a worst-case scenario of a bulldozer, jackhammer, and scraper operating simultaneously.

Table 5-8
Peak Attenuated Noise Levels (dBA) Expected from Construction Equipment

Source	Peak Noise Level	Distance from Source (in feet)						
		50	100	200	400	1,000	1,700	2,500
Heavy Trucks	95	84-89	78-83	72-77	66-71	58-63	54-59	50-55
Dump trucks	108	88	82	76	70	62	58	54
Concrete mixer	108	85	79	73	67	59	55	51
Jack-hammer	108	88	82	76	70	62	58	54
Scraper	93	80-89	74-82	68-77	60-71	54-63	50-59	46-55
Bulldozer	107	87-102	81-96	75-90	69-84	61-76	57-72	53-68
Generator	96	76	70	64	58	50	46	42
Crane	104	75-88	69-82	63-76	55-70	49-62	45-48	41-54
Loader	104	73-86	67-80	61-74	55-68	47-60	43-56	39-52
Grader	108	88-91	82-85	76-79	70-73	62-65	58-61	54-57
Pile driver	105	95	89	83	77	69	65	61
Forklift	100	95	89	83	77	69	65	61

Source: Golden et al. 1980

Table 5-9
Worst-Case Combined Peak Noise Level from Bulldozer, Jackhammer, and Scraper

	Distance from Source				
	50 feet	100 feet	200 feet	¼ mile	½ mile
Combined Peak Noise Level	103 dBA	97 dBA	91 dBA	74 dBA	34 dBA

The peak noise levels within 50 feet would probably be perceived as “striking” or very loud, comparable to peak crowd noise of an indoor sports arena. Beyond 200 feet, peak noise levels would be moderate, approximately comparable to a garbage disposal or vacuum cleaner at 10 feet. Peak construction noise levels would be considerably higher than existing background noise levels of 30 dBA. These peak noise levels would be localized and intermittent. The average time period a construction site would be active adjacent to a particular residence or business is 1-2 months.

The levee would extend within 50 feet of school classrooms and the construction CWL is located directly behind the Milton Middle School. Construction-related noise levels within the interior of the school building may reach over 100 dBA. The estimated

duration of construction adjacent to Milton Middle School is 3-4 months. In addition, trucking of materials past the school would occur throughout construction of the project and would have a significant increase in noise levels.

Day-Night Average Sound Level (DNL). The average community noise effects are typically represented by the DNL. While the DNL can account for the increased potential for disturbance by sounds occurring during normal sleeping hours, the projected construction schedule for Plan B does not include nighttime activity.

Based upon the projected construction activities of Plan B, the DNL would be approximately 55 dBA for any residential or business areas within 50 feet of an active construction site. Impacts from noise are significant for local residents and businesses. Noise at this level is equivalent to a residential air conditioner at 50 feet. The DNL would decrease as distance from the site increases (e.g., the approximate DNL would be 49 dBA at 100 feet, 43 dBA at 200 feet, and near existing background of 30 dBA at 900 feet). The projected DNL at various distances from construction sites is equal to or below the outdoor DNL value of 55 dBA established by EPA to protect against activity interference and hearing loss in residential areas and at educational facilities (Canter 1977).

The projected DNL at residential and business areas adjacent to construction sites represents a maximum increase of 25 dBA above typical background noise levels in Milton. Although an increase in noise levels above current background conditions results during construction of Plan B, the resulting noise level of 55 dBA approximates the background noise level of a suburban environment.

Upon completion of construction, the levee would reduce the natural sounds of the running water audible to residents and businesses adjacent to the Mud River. The operation of the pump stations at Johns Branch and Newmans Branch during high-rain events would generate noise during facility operation. The pump station at Johns Branch which would contain 45,000 gpm pump station and gatewell will be constructed to allow the interior runoff to be pumped out of the project. The pump station at Newmans Branch will include a 30,000 gpm pump constructed to handle the interior drainage. The noise level during facility operation would be approximately 60 dBA within 50 feet of the facility. The noise level at the houses nearest to the pump station (at a distance of 150 feet) would be approximately 50 dBA. Noise at this level would be infrequent and would likely occur during heavy rain events that contribute to background noise levels. Operation of the pumps would not be expected to cause any significant impacts.

Based upon the noise impacts analyses of Plan B, no hearing damage would be expected as the combined sound level and duration of exposure is well below those conditions associated with hearing damage. Construction workers who would be located closer to the noise sources and would experience longer exposure durations than the public would follow standard Corps and Federal Occupational Safety and Health Administration (OSHA) procedures for hearing protection.

Noise Impacts from Plan D

The noise impacts from Plan D would be the same as under Plan B for the Mud River and Newmans Branch and portions of the levee. Noise impacts at Perry Morris Square would be similar to those described for Johns Branch in Plan B.

Day-Night Average Sound Level (DNL). Based upon the projected construction activities of Plan D, the DNL would be approximately 55 dBA for any residential or business areas within 50 feet of an active construction site. Noise at this level is equivalent to a residential air conditioner at 50 feet. The DNL would decrease as distance from the site increases (e.g., the approximate DNL would be 49 dBA at 100 feet, 43 dBA at 200 feet, and near existing background of 30 dBA at 900 feet). The projected DNL at various distances from construction sites is equal to or below the outdoor DNL value of 55 dBA established by EPA to protect against activity interference and hearing loss in residential areas and at educational facilities.

The projected DNL at residential and business areas adjacent to construction sites represents a maximum increase of 25 dBA above typical background noise levels in Milton. Although an increase in noise level above current background conditions results from construction of Plan D, the resulting noise level of 55 dBA approximates the background noise level of a suburban environment.

Upon completion of construction, the completed levee would reduce the natural sounds of the running water audible to residents and businesses adjacent to the Mud River, Perry Morris Square and Newmans Branch.

As with Plan B, impacts from noise are significant for local residents and businesses, along with the middle school. No hearing damage would be expected as the combined sound levels and duration of exposure is well below those conditions associated with hearing damage. Construction workers who would be located closer to the noise sources and would experience longer exposure durations than the public would follow standard Corps and OSHA procedures for hearing protection.

5.5.6 Water Resources

This section discusses both surface water/floodplain management and groundwater impacts.

Surface Water/Floodplain Management

This subsection discusses the potential effects of the Milton flood control project on surface water and floodplain management in the project area. The methodology for determining impacts is presented, followed by a description of the impacts for each alternative.

Methodology

The surface water/floodplain management impacts discussion is based primarily on information generated by the Corps during their engineering analysis of the feasible alternatives for the Milton flood control project. Computer modeling of surface water velocities, water elevation profiles, areas of scour and sediment deposition, and induced

backwater flooding were performed to evaluate alternatives for the Milton flood control project. The analysis of impacts to surface water and floodplain management focuses primarily on the operation phase of the project during times of flooding, since during times of normal flow no changes will occur.

Surface Water/Floodplain Management Impacts from the No Action Alternative

Under the No Action Alternative, potential impacts to surface water/floodplain management associated with the construction and operation of the Milton flood control project would not occur. The surface water/floodplain management impacts of the No Action Alternative would be the same as the existing affected environment discussed in Section 4.1.6.1. Floodwaters would not be controlled and continued flooding of Milton would be expected to occur.

Surface Water/Floodplain Management Impacts from Plan B

Construction of the levee under Plan B will effectively contain floodwaters that would otherwise flow out into the floodplain in the Milton project area. The constriction of flow would result in slightly higher water surface elevations (flow depth) and increased velocity of flow during flood events (i.e. events that cause the waterways to overflow their banks) throughout portions of the project reaches. There are no projected changes in water surface elevations downstream of the confluence of Newmans Branch and the Mud River. Under normal flow conditions within the banks, the hydrologic regimes (peak flows, flow velocities, water surface elevations) of Johns Branch, Newmans Branch and Mud River within the project area will be unaffected by the Plan B.

Based on numerical modeling, through implementation of the levee protection project, several areas that lie outside of the limits of protection of the levees will be impacted by the minor projected increase in water surface relative to predicted baseline flood levels. These unprotected areas include:

- Residents situated across from Milton along the left-descending bank of the Mud River (Georgia Avenue area) immediately upstream of the project area would have approximately 0.3 feet of additional flood waters from a rainfall event similar to the 1997 flood levels.

Water Quality

During construction, short-term impacts from clearing land would occur. Exposed soil subjected to precipitation would create increased volumes of storm runoff, accelerated soil erosion and sediment yield. Localized but temporary increases in turbidity of Johns Branch, Newmans Branch and the Mud River may occur. Transport of sediment in surface runoff from disturbed areas into water bodies will be minimized through the use of properly designed and installed erosion and sediment control measures, such as silt fence, culvert inlet protection, temporary diversion dikes, and other measures. These measures would be addressed in an Erosion and Sediment Control Plan to be

developed for the project. Impacts to water quality from erosion of the construction of Plan B would be minor and short-term. (Refer to Section 6.2.4)

As discussed in Section 4.6.1, an SPCC Plan would be developed and would specify procedures to be followed that will minimize the potential for release of fuels and other liquids that could potentially contaminate soil, surface waters, and groundwater. An example of a method of protecting surface waters is to allow refueling and maintenance of heavy equipment only in areas that have secondary containment and are located away from surface water bodies.

Surface Water/Floodplain Management Impacts from Plan D

The configuration of the levee protection measures along the Mud River is very similar to that of Plan B except there is no channel diversion. The impacts of Plan D include a slight increase in surface water elevations for flows until the levee is overtopped.

Water Quality

The impacts to the water quality of Newmans Branch and the Mud River during construction and operation would be the same as described above for Plan B. Impacts to the Mud River, however, would be less during the construction phase since the river channel will not be relocated and therefore will have minimal impacts to water quality.

Groundwater

This subsection discusses the potential effects of the Milton flood control project on the groundwater in the project area. The methodology for determining impacts is presented, followed by a description of the impacts for each alternative.

Methodology

The groundwater impacts analysis considers a region of influence that includes the areas that would be affected by construction and operation of each alternative. These areas include the levee footprint and construction ROW; the soil borrow area; the staging areas; and channel relocation. Impacts were determined by assessing potential changes to existing groundwater quality that could result from construction activities and operations under each alternative. Because groundwater will not be used either for project construction or operation, no assessment of impacts to groundwater quantity is necessary.

Groundwater Impacts from the No Action Alternative

Under the No Action Alternative, the Milton flood control project would not be constructed and therefore there would be no potential effect on the groundwater quality of the project area. The groundwater would remain as described in Section 4.6.2.

Groundwater Impacts from Plan B

Potential groundwater impacts from the channel relocation include the change in groundwater flow regime from the existing channel location to the new channel location. The unconsolidated Teays alluvial and glacial deposits would allow the flow regime to adjust the flux of water delivered to the water table through the unsaturated zone and redistribute the groundwater flow to the new channel location. When the Mud River is diverted through the new channel the net saturated flow will become a recharge area into the surrounding soils until the equilibrium is achieved. The groundwater flow will continue to move toward the new channel and will act as a discharge area until equilibrium is achieved.

Other potential effects to groundwater from the implementation of Plan B are primarily associated with the construction phase of the project. During refueling or maintenance of heavy equipment there is potential for spills or leaks. If not immediately cleaned up, these substances can migrate downward through the soil column to the groundwater table.

Because the depth to groundwater is shallow in the area of the levee footprint and construction ROW, the potential to contaminate groundwater from spills or leaks of fuel or other petroleum-based fluids is greater in these areas. However, the SPCC Plan will identify steps to be taken to prevent spills, and also activities to be conducted if a spill occurs. Examples of preventative measures include refueling and maintenance only allowed in special lined areas that have secondary containment to capture spills should they occur. By using these best management practices, potential adverse impacts to groundwater would be minimized.

The potential impacts to the other areas affected by Plan B would be the same as described above for the levee footprint and construction ROW. However, the potential for groundwater contamination is probably slightly less in the borrow areas, as the depth to groundwater is likely greater there.

Groundwater Impacts from Plan D

The potential impacts to groundwater from Plan D are the same as described above for Plan B with the exception of the new channel impacts.

5.5.7 Ecological Resources

This section discusses the potential effects of the construction and operation of the Milton flood control project on the ecological resources at the proposed project location and the surrounding area. The methodology for determining impacts is presented, followed by a description of the impacts for each alternative.

Methodology

The biological impact analysis was performed by reviewing site documentation and previously documented environmental studies of the area of influence, and conducting field visits in coordination with the USFWS and West Virginia Department of Natural Resources. Information contained in the previous environmental studies and the Draft Fish and Wildlife Coordination Act Report was used in preparation of this section (Appendix C).

Aquatic Resources

Aquatic Resource Impacts from the No Action Alternative

Under the No Action Alternative, there would be no changes in land use at the proposed site. Except for future pressure of urban development, there would be no identified adverse impacts to aquatic resources from the No Action Alternative. Aquatic habitat, structure, and function would be unchanged and would continue as described in Section 4.7.1.

Aquatic Resource Impacts from Plan B

Several activities associated with construction of Plan B would have permanent and temporary impacts on the aquatic environment.

It is anticipated that the most significant impacts to these resources from Plan B would result from the modification of the natural river channel and associated river corridor with the same linear footage of newly-constructed, non-riparian channel. Aquatic losses associated with this action include the following: (1) there would be the loss of established deepwater riverine habitats that would not be replaced immediately with a new channel, (2) the loss of woody structure and debris within the channel, (3) loss of terrestrial inputs commonly occurring from the mature river corridor, (4) absence of shading, which is especially important during the summer low-flow periods, and (5) direct mortality of most fish in the existing channel.

In addition, certain construction and operation (ponding) activities are expected to result in localized impacts upon the aquatic resources near the mouth of both Newmans and Johns Branches, as ponding will increase mortality of terrestrial vegetation adjacent to the stream. This action would affect aquatic resources through the reduction of shading, which in turn, increases water temperatures therefore, decreasing dissolved oxygen. Tree cover over streams attracts foods and provides nutrients to the streams in the form of detritus. However, frequent inundation will help establish wetland-type plants in the ponding areas.

The construction of the levee west of the Mud River Road Bridge would result in the loss of mature riparian vegetation along the north bank of the river, thus increasing water temperatures during low flow periods, thus decreasing dissolved oxygen. As stated in the above paragraph, initially, the lack of tree cover will limit food sources and nutrients until vegetation along the riparian corridor is re-established.

Aquatic Resource Impacts from Plan D

Best management construction practices would be in place to limit increases in stream turbidity, thus limiting the impacts to aquatic resources. Because of the temporary and localized nature of the impacts, no long-term adverse impacts to aquatic resources are expected. It is anticipated that construction of Plan D would affect the aquatic resources of the Mud River project area in the following way: the construction of the levee would result in the loss of the mature riparian vegetation along the northern bank of the Mud River. This action would affect aquatic resources through the reduction of shading, which in turn, increases water temperatures therefore, decreasing dissolved oxygen.

This would be critical especially during the low-flow summer months. There would also be a reduction in terrestrial inputs to the river throughout the project reach.

In addition, certain construction and operation (ponding) activities are expected to result in localized impacts upon the aquatic resources near both Newmans Branch and Perry Morris Square, as ponding will increase the mortality of terrestrial vegetation adjacent to the stream. Tree cover over streams attracts foods and provides nutrients to the streams in the form of detritus. However, frequent inundation will help establish wetland-type plants in the ponding areas.

Terrestrial Resources

Terrestrial Resource Impacts from the No Action Alternative

Under the No Action Alternative, there would be no changes in land use at the proposed site. Within the proposed project area, the riparian vegetation is characterized primarily as bottomland hardwoods, and would continue as such. However, without a flood protection project for the City of Milton, future development would likely occur in flood-safe areas, which could be currently undeveloped fields or wooded areas. Therefore, impacts to terrestrial resources could be substantial in undisturbed areas if this Alternative is selected, because the resources could be permanently impacted by the encroachment of development.

Terrestrial Resource Impacts Plan B

Vegetation

Terrestrial impacts from Plan B would be the result of construction of an earthen levee and excavation of a new stream channel and borrow materials. Vegetation directly in the alignment of the levee would be removed and would no longer provide habitat for terrestrial organisms. This habitat would be permanently converted to maintain a treeless environment along the earthen levee. A change of species composition would occur in these altered environments.

The levee and channel relocation and associated features in Plan B would impact approximately 172.2 acres within the CWL. Permanent and temporary terrestrial impacts include 24.5 acres of Bottom Land Hardwoods (BLH), 3.8 acres of Mixed Hardwoods, and 52.4 acres of Open Agricultural (OA) habitat types. The permanent impacts to terrestrial habitat resulting from the construction of the levee and associated features would be 56.59 acres of habitat. The levee would displace approximately 21.5 acres of terrestrial habitat along approximately 8,300 feet, including early seral riparian and open/agricultural areas. Excavation of soil borrow areas would also impact 15.21 acres of terrestrial resources. Approximately 1.9 acres of wetland habitat would be removed from the project area as a result of construction of Plan B.

Species composition would be altered by construction of the levee and these areas would no longer provide habitat for terrestrial organisms. Disturbances resulting from construction of Plan B would result in the initiation of early secondary succession, which is characterized by dominance of introduced and, perhaps, invasive weedy species. In this unstable environment, the only tree species that would begin to establish would be those with effective seed dispersal, including sycamore (*Platanus occidentalis*), silver

maple (*Acer negundo*), cottonwood (*Populus deltoides*) and elm (*Ulmus rubra*). This successional stage would likely continue between five and ten years, followed by more permanent vegetation (perennials herbs and woody seedlings/saplings as opposed to annuals) which would become established and stabilize the environment.

Impacts to terrestrial resources from Plan B could be minimized by planting of native vegetation following construction. This would help to re-establish plant species, while also anchoring the soil and providing habitat. Planting native species of grasses, wildflowers, shrubs, and trees that offer more valuable habitat would jump start succession and lead to successful mitigation efforts. Native species would not dominate as quickly as typical early secondary successional species, but with proper planting methods would minimize impacts to terrestrial resources in the project area.

Indirect and temporary impacts from this Alternative would be limited to areas within the Construction Work Limit, which covers approximately 172 acres in the project area. The amount of each habitat type within the CWL for this Alternative are listed in Table 5-10. Temporary impacts to terrestrial resources would result from use of land for staging areas and temporary roads and bridges for transportation of construction materials.

Acquisition of property to construct the levee would extend from the construction work limits on the “protected” side of the levee to the edge of the stream along the alignment. Therefore, land between the “wet” side of the levee and the Mud River would be precluded from development. Restrictive covenants would be applied to these important riparian habitats thereby precluding man-induced disturbance. These areas would increase in habitat value over time as natural succession takes place. The levee footprint was designed to minimize land used during construction and where possible, trees and vegetation will not be disturbed. The soil from the channel construction would be utilized first to construct the levee. Only if needed will the other soil borrow area be utilized.

Wildlife Resources

During site clearing activities, highly mobile wildlife species or wildlife species with large home ranges (such as deer and birds) would be able to relocate to adjacent undeveloped areas. However, successful relocation may not occur due to competition for resources to support the increased population and the carrying capacity limitations of areas outside the proposed development. Species relocation may result in additional pressure to lands already at or near carrying capacity. The impacts could include overgrazing (in the case of herbivores), stress, and over-wintering mortality. For less mobile species (reptiles, amphibians, and small mammals), direct mortality could occur during the actual construction event or ultimately result from habitat alteration.

The U.S. Fish and Wildlife Service has determined that suitable foraging and roosting habitat for the Federally-endangered Indiana Bat occurs within the project area. Accordingly, the Corps intends to conduct mist net surveys at the appropriate season prior to initiating project construction.

Terrestrial Resource Impacts Plan D

Vegetation

The levee and associated features in Plan D would impact approximately 119.1 acres within the CWL. Permanent and temporary terrestrial impacts include 17 acres of Bottom Land Hardwoods (BLH), 0.3 acres of Mixed Hardwoods, and 31.5 acres of Open Agricultural (OA) habitat types. The permanent impacts to terrestrial habitat resulting from the construction of the levee and associated features would be 55.1 acres of habitat. The levee would displace approximately 21.5 acres of terrestrial habitat along approximately 8,300 feet, including early sere riparian and open/agricultural areas. Excavation of soil borrow areas would also impact 15.21 acres of terrestrial resources. Approximately 1.9 acres of wetland habitat would be removed from the project area as a result of construction of Plan B. Terrestrial impacts from Plan D are primarily the result of construction of an earthen levee and excavation at borrow sites. Vegetation directly within the alignment of the levee would be permanently removed and replaced with a treeless environment.

Species composition would be altered by construction of the levee and these areas would no longer provide habitat for terrestrial organisms. Species composition and disturbance for Plan D are similar to Plan B. Minimization of the terrestrial resources would also be similar to Plan B.

Temporary impacts from Plan D would be confined to areas within the Construction Work Limits, which covers approximately 119.1 acres (see Table 5-10). These impacts would primarily result from use of staging areas and establishment of transportation corridors within the project area.

Acquisition of property to construct the levee would extend from the construction work limits on the “protected” side of the levee to the edge of the river along the alignment. Therefore, land between the “wet” side of the levee and the Mud River would be precluded from development. Restrictive covenants would be applied to these important riparian habitats thereby precluding man-induced disturbance. These areas should increase in habitat value over time.

Wildlife Resources

The Impacts to Wildlife Resources from Plan B are the same as Plan D.

The U.S. Fish and Wildlife Service has determined that suitable foraging and roosting habitat for the Federally-endangered Indiana Bat occurs within the project area. Accordingly, the Corps intends to conduct mist net surveys at the appropriate season prior to initiating project construction.

Table 5-10
Acres of Habitat Type within CWL for both Alternatives

Terrestrial Habitats	Acres within CWL for Plan B	Acres within CLW for Plan D
Bottom Land Hardwoods (BLH)	24.5	17
Early Sere Riparian	16	12.4
Mixed Hardwoods	3.8	0.3
Open/Agricultural	52.4	31.5
Disturbed* Wetland	9.3	4.5
Palustrine Emergent	10.7	3.3
Palustrine Forested	1.5	0.3
Palustrine Scrub/Shrub	1.3	0.4
Urban Industrial	42.9	46.7
Water	9.8	2.7
Total	172.2	119.1

*A Disturbed Wetland is a wetland that has had human activity which has affected one of the three standard criteria for identification of a wetland.

5.5.8 Cultural Resources

This section discusses the potential impact on cultural resources of the Milton flood control project from construction activities and operation in the potentially affected areas. The methodology for determining impacts is presented, along with a description of the impacts from each alternative on cultural, historical, architectural and archeological resources.

Methodology

Federal agency responsibilities with regard to cultural resources are addressed by a number of laws, regulations, executive orders, programmatic agreements and other requirements. The principal federal law addressing cultural resources is the *National Historic Preservation Act* (NHPA) of 1966, as amended (16 United States Code [USC] Section 470), and implementing regulations (36 Code of Federal Regulations [CFR] 800), that describe the process for identifying and evaluating historic properties, for assessing the effects of federal actions on historic properties, and for seeking consultation to avoid, reduce, or minimize adverse effects. The term “historic properties” refers to cultural resources that meet specific criteria for eligibility for listing on the National Register of Historic Places (NRHP). This Section 106 process does not require preserving historic properties but does ensure that federal agency decisions affecting these places consider cultural and historic values and the options available to protect the properties.

This investigation includes identifying, evaluating, and assessing effects on cultural resources from construction and operation of the Milton flood control project in concurrence with the State Historic Preservation Officer (SHPO). Other agencies, Native American groups, and those with an interest in the undertaking may become consulting parties in this process, as outlined in 36 CFR 800.2(c). The Advisory Council

on Historic Preservation (ACHP), an independent federal agency, administers the provisions of Section 106 regarding cultural resources and has review and oversight responsibilities defined throughout 36 CFR 800. Additional cultural resource management responsibilities of the Corps are addressed in other sections of the NHPA and in other federal laws, regulations, and executive orders.

Potential impacts to cultural resources, in general, are assessed by applying the criteria of adverse effect, as defined in 36 CFR 800.5a. An adverse effect is identified when an action could alter the NRHP-qualifying characteristics of a historic property in a manner that would diminish the integrity of the property's location, design, setting, workmanship, feeling, or association. Adverse effects can include reasonably foreseeable effects caused by the action that could occur later, that could be farther removed in distance, or that could be cumulative. Activities conducted under the alternatives are measured against the criteria of adverse effect to determine the potential for and intensity of impacts to cultural resources. Consultation with the affected communities is required to identify, assess, and address impacts to Traditional Cultural Properties (TCPs). TCPs are places or activities associated with the cultural heritage or beliefs of a living community and are important in maintaining cultural identity. Potential impacts to TCPs can include physical destruction or disturbance, loss of access or privacy, and alteration of setting.

Cultural Resource Impacts from the No Action Alternative

There would be no construction under the No Action Alternative, and thus no known or potential cultural resources would be affected during construction. Visual impacts to the setting of historic structures from prominent levees would not occur. However, the existing potential for flooding would continue and these cultural resources would remain unprotected from any such flooding. The residents in the 100-year flood plain would remain particularly susceptible to flooding, given their location. Renovations following a flood often introduce non-historic materials and designs to properties, compromising the integrity of the cultural resource. The No Action Alternative could result in the demolition of historic buildings in favor of modern, elevated buildings.

Cultural Resource Impacts from Plan B

The construction and operation of Plan B would not have direct adverse effects through demolition or alternation of any listed NRHP cultural resources. All such properties are located a block or more landward of the levee construction ROW and construction staging areas.

A beneficial effect of Plan B would be the protection of cultural resources from future floods comparable to the flood of record. Renovations following a flood often introduce non-historic materials and designs to properties, compromising the integrity of the cultural resource.

Locations of archeological resources in the area are listed in Table 4-9, however, only one site were found within the CWL. This area was originally designated as a borrow area. The site will now be utilized as a staging area if needed. An inventory of archeological sensitive areas was made to identify potentially eligible resources. Because construction will require ground-disturbing activities, there is potential for

discovery of subsurface archeological resources throughout the project. An unanticipated discovery plan will be developed and approved prior to construction.

Cultural Resource Impacts from Plan D

The construction and operation of Plan D would not have direct adverse effects through demolition or alternation of any listed NRHP cultural resources. The effects of the levee along the Mud River would have the same direct and indirect effects to significant properties as under Plan B.

The potential for unexpected discovery of subsurface archeological resources during construction exists for Plan D as well as Plan B. Such discovery would be handled in the same manner as under Plan B, in accordance with the unanticipated discovery plan procedures. As under Plan B, a beneficial effect of Plan D would be the flood protection provided for cultural resources in the Milton area.

5.5.9 Socio-economic Resources and Environmental Justice

This section describes the potential effects of the alternatives on the existing social and economic environment of the community of Milton and for the Cabell County region of influence (ROI) as a whole. To facilitate the discussion of such complex and interrelated issues, the economic and social resources are addressed separately. Social impacts, include such as changes in population, housing, community services, and community cohesion. Included with the discussion of social impacts is the analysis of environmental justice issues associated with the project, as required pursuant to Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (Volume 59, Federal Register, Number 32). The discussion of environmental justice identifies and addresses disproportionately high and adverse human health and environmental effects on minority or low-income populations from activities associated with implementation of the Milton flood control project.

Methodology for Determining Social Impacts

Community Cohesion

Community cohesion is a tool for measuring the stability of the community during and after the large disruption associated with a flood protection project. The implementation of any large private, public or civil works project would affect the stability of a community both positively and negatively in some fashion. In order to measure community cohesion and gain a solid understanding of community issues in the project area, data were collected through semi-structured interviews with community leaders and direct observations during field surveys. The interview questions were reviewed and analyzed by a behavioral psychologist with expertise in survey methodology and were then used as the basis for assessing community cohesion in the project area. Field surveys included a visual study of the community along with written descriptions of the existing activities, public services available, infrastructure, sports and recreation, and residential and commercial development.

Interview data were supplemented with demographic census data of the project area. General population data as well as economic, social, and housing characteristics were collected for Milton (U.S. Census Bureau, 2000). Data on religious organizations for

Cabell County, West Virginia were also collected and used as a comparison during field surveys (American Religion Data Archive, 2000).

Environmental Justice

Environmental justice guidance developed by the CEQ defines “minority” as individual(s) who are members of the following population groups: American Indian or Alaskan Native, Asian or Pacific Islander, Black, or Hispanic (CEQ 1997). Minority populations are identified when either the minority population of the affected area exceeds 50 percent or the percentage of minority population in the affected area is meaningfully greater than the minority population percentage in the general population in the surrounding area or other appropriate unit of geographical analysis. Low-income populations are identified using statistical poverty thresholds from the Bureau of Census (defined in 2000 as 1999 income less than \$17,463 for a family of four).

Environmental justice impacts become issues of concern if the proposed activities result in disproportionately high and adverse human and environmental effects to minority or low-income populations. Disproportionately high and adverse human health effects are identified by assessing these three factors to the extent practicable:

- Whether the health effects, which may be measured in risks or rates, are significant (as defined by NEPA) or above generally accepted norms. Adverse health effects may include bodily impairment, infirmity, illness, or death.
- Whether the risk or rate of exposure of a minority population or low-income population to an environmental hazard is significant (as defined by NEPA) and appreciably exceeds or is likely to appreciably exceed the risk or rate to the general population or other appropriate comparison group.
- Whether health effects occur in a minority population or low-income population affected by cumulative or multiple adverse exposures from environmental hazards.

The assessment of environmental justice impacts is limited to individuals directly affected by the project. For this analysis, only residents of Milton, especially those residents requiring relocation, were considered for potential environmental justice impacts.

Socio-economic and Environmental Justice Impacts from the No Action Alternative

Under the No Action Alternative, a levee would not be constructed to protect residents of Milton from flooding. Future flooding could result in major social and economic impacts to Milton, such as residential and business structural damage and relocation, which could otherwise have been avoided by the presence of a project.

The No Action Plan does not propose the relocation of any residential or commercial structures. Thus, neighborhoods would remain intact and community cohesion would not be impacted.

Under the No Action Alternative, federal funds would not be used to perform flood reduction measures in the project area, and thus the requirement to comply with Executive Order 12898 would not be triggered. However, the No Action Alternative could have disproportionately high or adverse effects on Milton's low-income populations as residential properties located near Mud River continue to flood during heavy rains, potentially causing property damage.

Socio-economic and Environmental Justice Impacts from Plan B

Employment Impacts

The construction of the Plan B levee will be conducted in one distinct phase. With Plan B, one business would be taken in accordance with the *Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970*, as amended (42 USC §4601 et seq.). Considering, the relatively small residential and commercial size of Milton, the urban area affected may be considered moderately impacted.

Since no new jobs would be created to operate and maintain the levee infrastructure, no economic impacts would occur as a direct effect of a project once the construction has been completed. The protection offered by the levee would negate the need for flood insurance within the protected areas of Milton thus increasing disposal personal income, and may attract new businesses to locate within the protected area thereby potentially creating additional employment.

Social Impacts

Impacts to housing would result from the required relocation of 6 residences within the project construction area. In accordance with the *Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970*, as amended, landowners of properties that must be acquired to construct a project would be compensated. Displaced persons, including those who rent, would also be compensated for eligible moving expenses. These individuals could relocate to similar housing within Milton as available. This impact may be considered moderate since after the 1997 flood, over 16 residences were relocated as a result of FEMA buyouts.

Impacts to community services would be negligible. No new students would be added to the local school systems and local fire and police services would not be stressed. Medical services would likely experience a slight increase in use due to the minor accidents typically associated with a large construction project located in the area. Barring a major accident however, medical services would not be stressed beyond capacity.

Community Cohesion

A primary impact associated with Plan B is the potential loss of the parking area for the Cabell County Fair and the Pumpkin Festival resulting from the construction of the new Mud River channel. The Pumpkin Festival is an important community event that encourages the interaction of residents during the festival activities and during the planning stages of the event. In addition to the local attendance, the Pumpkin Festival is Milton's largest community event attracting thousands of visitors annually. If Plan B is implemented, ample parking would need to be provided in a different location or the City

may not be able to accommodate the festival's attendees. (Refer to Mitigation Plan in Section 6.2.5).

Although Plan B would impact the community cohesion of Milton due to the relocation of a few residents, it would produce overall positive benefits for the City through the implementation of flood reduction measures up to a 0.4% exceedance storm event (or 250-year flood occurrence). Reducing the impacts of large floods would substantially reduce personal and public costs associated with repairing damaged property and cleanup activities.

Environmental Justice

Increased flood protection as a result of the Proposed Action would decrease the risk of flooding in Milton for the 0.4% chance of exceedance event. Thus, the costly economic effects associated with flooding, such as the cost of repairs to damaged structures and property loss, would be substantially reduced.

Under Plan B, six residential and one commercial buildings would be displaced. These residences and businesses have been often flooded in the past during significant storm events.

It is not anticipated that the Proposed Action would have a disproportionately high or adverse effect on minority or low-income populations. Rather, the proposed project activities, including relocation, would provide beneficial impacts for Milton residents and business owners since they would ultimately reduce the potential for future property damage caused by flooding.

Socio-economic and Environmental Justice Impacts from Plan D

Employment Impacts

The construction of the Plan D levee would be conducted in one phase.

Since no new jobs would be created to operate and maintain the levee infrastructure, no economic impacts would occur once the construction was completed. The protection offered by the levee may reduce insurance rates within Milton and may assist in attracting new businesses to the City, thus potentially creating more jobs for the residents of Milton.

Social Impacts

Social impacts under Plan D would be significant compared to those of Plan B. There are 29 residences and six businesses located within the real estate taking area of Plan D which would be displaced. Impacts to community services would be similar to those with Plan B.

Community Cohesion

The primary impact to community cohesion associated with Plan D is the displacement of several structures including 23 residences in Harbour Trailer Park, as well as six businesses located on the north side of Mud River. During interviews, community

representatives were asked if residents in Milton would be willing to relocate from the areas that are repeatedly flooded. They answered by describing how the relocation of approximately 16 residences in response to the flood in 1997 was extremely stressful to the community since the close interactions among those neighbors was severely disrupted. The owner of Harbour Trailer Park responded further by commenting that his tenants would be reluctant to relocate due to the risk of losing the daily interactions among their neighbors.

If Plan D is implemented, 29 residences and six businesses located on the north side of Mud River would be relocated. However, Plan D would not require relocation of parking areas and would not impact the annual Pumpkin Festival or the Cabell County Fair. Plan D would have significant impacts to community cohesion and would only provide flood protection for 5% chance (20-year) annual events.

Environmental Justice

Plan D would provide a lower level of flood protection and decrease the risk of flooding in Milton for 5% chance (20-year) annual event. Consequently, the high costs resulting from floods of this magnitude, such as repairing or replacing damaged property, would be substantially reduced. Under Plan D, 29 residential homes and six businesses would be relocated. These homes have historically been flooded during significant storm events.

Relocation of homes in response to past flood events has been deemed unfavorable among Milton residents (Harbour, pers. com., 2002). Plan D requires a greater number of property relocations, and the overall benefit to Milton is significantly reduced since flood protection measures would only protect against 5% chance (20-year) annual event.

It is not anticipated that the Proposed Action would have a disproportionately high or adverse effect on minority or low-income populations. Rather, the proposed project activities, including relocation, would provide beneficial impacts for Milton residents and business owners since they would ultimately reduce the potential for future property damage caused by flooding.

5.5.10 Recreational Resources

This section analyzes the impacts to recreational resources in the Milton area from each alternative. The methodology for analysis is presented, followed by a description of the impacts from each alternative.

Methodology

The impacts resulting from each alternative were determined through comparison with the existing recreational resources available to the City of Milton. Impacts to recreation resources would be focused in this location; however slight changes to region wide recreation resources may be experienced. Impacts to recreational facilities were determined based on changes to the existing condition. The method of quantifying usage impacts to recreation resources often consists of surveying users of the resources. Such a survey is beyond the existing scope of this study, therefore usage impacts have been evaluated qualitatively.

Recreational Resource Impacts from the No Action Alternative

Under the No Action Alternative, a flood protection project would not be constructed for Milton. Therefore, no changes would result to the existing recreational resources. Usage of existing recreational resources would not be affected. However, none of the existing recreational resources would be protected from future flooding.

Recreational Resource Impacts from Plan B

Plan B would provide 0.4% chance of exceedance flood protection for Milton. The primary recreational area that would be impacted under this plan is the parking area for the annual Pumpkin Festival and Cabell County Fair. The undeveloped area would be impacted by construction of the relocated river channel. This impact could be offset by utilizing one of the nearby borrow areas after construction is complete. Another alternative would be coordinating with Festival planners and proposing corridors of parking throughout areas of the City and establishing a courtesy transportation system from these areas to main attractions of the festival.

Impacts to other regional recreational resources would be minor. No significant change in use of the Milton Little League Park would be expected; however, it would occasionally be flooded. Boating, principally canoeing on the Mud River in Milton could decline slightly, however regional usage of the river is not expected to change.

Other recreational activities located north of the Mud River would be protected from flood events.

Recreational Resource Impacts from Plan D

Implementing Plan D would not have a significant impact on recreational activities in Milton. A temporary impact could occur at the Pumpkin Festival parking field due to construction of the levee. Overall flood protection for the City, including the areas frequently used for sports and recreation, would not be protected against floods greater than 5% chance of exceedance flood events, (about that of the 1997 flood).

5.5.11 Aesthetic and Scenic Resources

This section discusses the potential effects of the Milton flood control project on the aesthetic and scenic resources of the project site and other potentially affected areas. The methodology for determining impacts is presented followed by a description of the impacts from each alternative.

Methodology

Changes in the natural environment, impacts on landmarks and cultural resources, and the design quality of the levee all affect the aesthetic and scenic qualities of the project area. Direct impacts to landmarks and cultural resources are discussed in Section 5.5.8, Cultural Resources, and Section 5.5.10, Recreational Resources. The effects on aesthetic and scenic resources are evaluated in terms of value, scale, and extent. Value can be defined as benefiting, distracting, or leaving unchanged an individual's sense of visual enjoyment. The scale of the change can be either minor, in that it complements the existing scene, or major, in that it significantly alters or eliminates the existing scene. The extent of the change is a measure of the visibility of the constructed features and the number of people it affects.

This analysis provides a general assessment of aesthetic and scenic impacts to the project area measured in terms of value, scale, and extent. Impacts are discussed on a community-wide (Milton) and local scale.

Visual Resource Assessment Procedure

The Corps Visual Resource Assessment Procedure (VRAP) was conducted as a part of this study. The VRAP process includes identifying the regional landscape, inventorying existing aesthetic resources, assessing visual impacts, obtaining public input, evaluating alternative plans, and forecasting with and without project conditions using visual simulations of design alternatives. This procedure provides greater detail on the potential impacts to aesthetic and scenic resources and assists in providing appropriate aesthetic mitigation features in the design of the final selected plan. Mitigation features could include but would not be limited to landscaping, and certain maintenance and design features that would integrate the project into the visual fabric of the community. (See *Appendix D, Visual Resource Assessment*).

Aesthetic and Scenic Resource Impacts from the No Action Alternative

Under the No Action Alternative, no structural or nonstructural measures would be implemented by the Corps to protect Milton. Therefore, there would be no impacts to aesthetic and scenic resources from construction of a flood control project. Existing views of the water bodies would not be obstructed or altered. Riparian areas would remain in private ownership and would not be altered by clearing or construction activities. Further, in the absence of flood protection additional deferred maintenance and abandonment of businesses and residences is expected. This process of decline due to flood damages and deferred maintenance would continue to degrade the visual and scenic quality of the community.

Aesthetic and Scenic Resource Impacts from Plan B

Under Plan B, a levee would be construction along the north and south bank of the Mud River, crossing the Mud River at two locations and relocating approximately 4,084 feet of river channel. A gate closure would be installed just north of the Mud River highway bridge on Mud River Road near the fairgrounds. The levee would appear to have a uniform top elevation along the length of the structure; however the actual height would vary relative to the topography. The height of the levee would gradually increase from the tie-in with existing higher ground to a maximum of 26 feet at certain locations. The majority of the structure would range in height from 17 to 21 feet. The levee would have an average base width of 105 feet. The existing river channel would be relocated to the south of the constructed levee through a new, naturally designed channel about 4,084 feet in length.

Only a small portion of the community would see the levee since the view would be blocked by vegetation, residences and other buildings. Except for views down the streets that would be captured by the levee, those structures would be seen mainly by those landowners immediately adjacent to the levee alignment. The public would see the levee by traveling on Mud River Road near the highway gate closure. The most significantly impacted views would be along Mud River Road and U.S. Route 60 where the western section of the levee parallels the road. Mitigation measures, such as landscaping, would significantly reduce the visual impacts of the project.

Local impacts to aesthetic and scenic resources are more severe to property owners along the Mud River. This waterway defines the boundaries of several properties throughout the community. The construction of the levee would have significant impacts on these properties. Several structures would have to be acquired to accommodate the levee.

Aesthetic and Scenic Resource Impacts from Plan D

Plan D includes the construction of a levee along the north bank of the Mud River. Plan D would differ from that of Plan B for flood control measures, as no channel relocation would be required. The levee would appear to have a uniform top elevation along the length of the structure; however the actual height would vary relative to the topography. The height of the levee would gradually increase from the tie-in with existing higher ground to a maximum of about 18 feet at certain locations. The majority of the structure would range in height from 7 to 11 feet. The levee would have an average base width of 57 feet.

With this alternative, people traveling through Milton on U.S. Route 60 on the eastern section of the project could see the levee across from Perry Morris Square. Typically, on the western section of the project, the views would be similar to the views described for Plan B.

The visual impacts of Plan D would be similar for many Milton residents except that for most of those residents traveling on U.S. Route 60 east of Mud River Road would have significant more visual impacts. With Plan D, the scenery of the locale would be significantly altered, most noticeably from the removal of several businesses and homes; thereby the value of the aesthetic and scenic resources in the immediate area would be greatly diminished. Thus, the scale and extent of visual modification with Plan D is greater than Plan B.

5.5.12 Hazardous, Toxic, and Radioactive Waste

This section describes the potential waste management issues resulting from unearthing historic hazardous, toxic, or radiological waste (HTRW) disposal in the project area that would need to be addressed prior to construction of the Milton flood control project. The methodology for determining impacts is presented, along with a description of the potential impacts from handling, storage, transportation, and disposal of solid and hazardous waste.

Methodology

Prior to initiation of construction activities on the subject properties located within the Lower Mud River Flood Control Project, HTRW Investigations must be completed. HTRW investigations include evaluation of the potential for HTRW to be disturbed during construction of the Milton flood control project and the potential environmental impacts from the handling, storage, transportation, and disposal of such waste.

Phase I HTRW Investigations are performed to identify the potential for contamination and determine the necessity for further investigations. The cost of Phase I HTRW Investigations is considered project cost and cost shared in accordance with provisions of the Water Resources Development Act of 1986. Phase I HTRW investigations consist of non-intrusive investigations to determine the potential for the presence of HTRW materials on properties within the project work limits.

Phase II HTRW Investigations are performed on properties within the project work limits identified by the Phase I as having potential for the existence of contamination. Phase II HTRW Investigations are intrusive and include site investigations and sampling and analysis to confirm the presence of hazardous substances. The costs of Phase II Investigations are considered project cost and cost shared in accordance with provisions of the Water Resources Development of 1986. If results of the Phase II Investigations confirm that HTRW contamination is present, responsibility and cost of further investigation and remediation of all hazardous substances regulated under CERCLA is that of the local sponsor and/or landowner and shall not be included as a project cost. Contaminated properties subject to remediation of HTRW substances must be remediated prior to construction activities at that site.

HTRW investigations are performed in accordance with USACE regulations and by standards set by ASTM E 1527 - *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process* and ASTM E 1528 - *Standard Practice for Environmental Site Assessments: Transaction Screen Process*.

Hazardous, Toxic, and Radiological Waste Impacts from the No Action Alternative

Under the No Action Alternative, the Milton flood control project would not be constructed. Consequently, potential HTRW contamination and HTRW management issues would not be addressed as a result of this project.

Hazardous, Toxic, and Radiological Waste Impacts from Alternative B

Based on field observations, record review process, interviews and historical information there are seven properties (Tracts 7-18, 4-77, 4-78, 4-79, 7-8, 9-5.1 and 7-18) within the Milton area where potential HTRW concerns were identified. An eighth area of concern is the Mud River. Sampling and analysis has been performed on Tract 7-18 and at several locations within the Mud River.

Tract 7-18 is owned by Donald Chapman/former G & K Equipment Co. It is located west of the Milton Middle School. A Phase II HTRW Investigation was previously conducted for this site. Polyaromatic hydrocarbons (PAHs) above the WV DEP Underground Storage Tank Division guidelines were detected at this site, along with iron and arsenic, which were detected above USEPA Region III Soil Screening Guidance. Visual staining

in various locations was also observed. The site was recommended for further Phase II investigation activities. At the time of this report, the site is currently being investigated by USACE contractors.

Tract 4-77 (Mary Ball properties), and Tracts 4-78 and 7-8 (Jeff Jackson properties), are bounded by former service station property. Phase II investigations are recommended due to the potential migration of petroleum contaminant from the former service station.

Tract 4-79 (Farm House Stores) is located at 1605 West Main Street. The site was the locations of a former service station and there are no records of underground tank removal activities occurring at the site. Due to a potential for petroleum contamination, a Phase II investigation utilizing a magnetometer survey in the area of the suspected tank area, in addition to soil and groundwater sampling and analysis, have been recommended.

Tract 9-5.1 (Gary and Brenda Elkins property) is currently being utilized as a construction storage area. Two leaking 55 gallon drums which have visibly stained the soils were identified at the site. In addition, the entire site has been filled with material from unknown sources. A Phase II investigation has been recommended due to the potential of unknown wastes may be located onsite.

Tract 20C-8 is residential property which contains trash and debris including tires, roof shingles, abandoned cars bodies and and other auto parts. Although this property was included in the Phase I investigation, this site may or may not be located within the project work limits. If it is determined that this site is located within the project boundaries, the debris and material would need to be removed from the property in accordance with all applicable state and federal regulations. Removal of a minor amount of residential, household trash and debris may be removed as part of project costs.

Tract 6-163 is the location of a former scrap metal business and contains numerous scrap metal parts stored in sheds and within the property boundary. Prior to USACE involvement in real estate activities at the site, the sponsor and/or owner will be required to remove all debris and material from the property in accordance with all applicable state and federal regulations. A visual inspection of the property will be conducted following disposal of the solid waste materials.

The Mud River in the vicinity of the project work limits is also an area of concern. Analysis of the Mud River for fecal coliform was conducted during a previous Phase II investigation at several locations within the project work limits. The Mud River in the vicinity of the project work limits was recommended for further Phase II investigation activities. At the time of this report, the site is currently being investigated by COE contractors.

Prior to finalization of the Supplemental Environmental Impact Statement, all recommendations for further HTRW investigations for each tract will be completed.

Hazardous, Toxic, and Radiological Waste Impacts from Alternative D

Since all the tracts described in Alternative B coincide with the CWL for Alternative D, the same recommendations will be pursued. The areas of concern identified in

Alternative B would be the same tracts of property which would be affected by Alternative D.

5.5.13 Health and Safety

This section presents potential health effects of the proposed Milton flood control project on both workers and the public. The methodology for determining impacts is presented, along with a description of the impacts of each alternative.

Methodology

Occupational and public health and safety issues have been evaluated in the context of those activities with the potential to affect human health and safety. The areas identified are construction noise and air emissions, as well as flooding. Air quality, noise, and water quality considerations are addressed in other sections.

Health and Safety Impacts from the No Action Alternative

Under the No Action Alternative, the Milton flood control project would not be constructed. Consequently, there would be no construction noise or air emission impacts to workers and the public. However, the potential for large flooding events to impact public health and safety by exposing the citizens of Milton to disease, injury and death would still exist.

Health and Safety Impacts from Plan B

Plan B involves the construction of an earthen levee with part of the Mud River being relocated to protect Milton. Typical worker impacts present in the construction industry would be expected from the construction of the proposed levee. During construction, compliance with Federal Occupational Safety and Health Administration (OSHA) construction safety standards will be the responsibility of the construction contractor selected for the project. In addition, the contractors will be required to file a safety plan in accordance with the Corps' "Safety and Health Requirements Manual", EM 385-1-1. Compliance with these standards would provide for basic protection of worker health and safety during both construction and operation.

The noise generated from construction of the levee could likely be perceived as loud to striking by residents within one-fourth mile of the project site, when compared to background noise levels. As explained in Section 5.5.5, no damage to residents hearing would be expected; however, near Milton Middle School the noise could be significant when school is in session. Workers, who would be the closest to the noise sources and therefore would be exposed to the highest noise levels, would be required to wear hearing protection under OSHA regulations.

Construction workers would potentially be exposed to dust and airborne emissions from routine activities such as welding, soldering, grinding, and cleaning operations. These exposures would be intermittent, but may be intense and would be evaluated at the time of construction. Appropriate health and safety measures would be implemented for all identified and anticipated hazards to worker health and safety. Therefore, the potential adverse impacts to worker health and safety during construction would be minimized.

While the construction effects of the project are temporary, increased exposure to fugitive dust and NOx levels from the operation of heavy equipment can be associated with potential health effects. For sensitive populations (e.g., school children at Milton Middle School) these effects could include aggravated asthma and an increase in respiratory symptoms like coughing and chronic bronchitis. Any effects would be localized and would be reduced to the extent possible using appropriate mitigation measures such as watering of roads and active construction areas as required.

Truck traffic from the borrow areas will not go through the city, but will utilize a haul road which will run parallel to the Mud River and go under Mud River Road Bridge minimizing impacts to local traffic. Access roads associated with worker's personal vehicles, construction materials and equipment drop off would be the only on-road traffic associated with the project. Crossing guards would be required at the school and speed limits would be enforced to provide a safe environment during construction.

With Plan B, construction of the levee would greatly reduce the impact of flooding events greater than the flood of record on Milton. Floodwaters would be contained by the levee, but high volumes of storm water runoff from significant storm events within the interior of the protected area could cause some minor, nuisance flooding. However, pump stations will be installed at Johns Branch and Newmans Branch to maintain ponding levels below elevations where damage could occur.

Because the sewage treatment lagoons located in the southern section of the project area would not be protected, any partially treated sewage present in these lagoons would overflow into the Mud River during a flood event, as is the current condition.

Implementation of Plan B would have a significant positive impact on the reduction of flood hazard as well as the potential health and safety impacts associated with the aftermath of floods.

Health and Safety Impacts from Plan D

The health and safety impacts from Plan D would be the same as the impacts for Plan B for the Mud River portions of the levee. As with Plan B, Plan D would have a less of an impact on the reduction of flood hazard as well as the potential health and safety impacts associated with the aftermath of floods.

5.5.14 Infrastructure

This section analyzes the impacts to the existing infrastructure in the Milton from each alternative. The methodology for analysis is presented, followed by a description of the impacts from each alternative.

Methodology

The impacts resulting from each alternative were determined through comparison with the existing infrastructure in Milton. Impacts to the infrastructure of Milton would only occur in the project area due to construction of the levee and associated facilities. Infrastructure affected by the proposed alternatives includes sewer lines and lift stations,

water lines, electric transmission and phone cables, and roadways. New infrastructure that would be added as a result of the proposed alternative is also presented.

Infrastructure Impacts from the No Action Alternative

Under the No Action Alternative, a flood protection project would not be constructed for Milton. Therefore, no changes would result to the City infrastructure. However, none of the existing infrastructure would be protected from future flooding .

Infrastructure Impacts from Plan B

Under Plan B, a levee, two pump stations, two sumps and associated pumps would be constructed and installed to protect Milton from flooding. The new levee infrastructure under Plan B would consist of the following:

- 8,312 feet of levee in Milton;
- a 6.4-foot-high stop log gate where the levee crosses Mud River Road;
- 4,048 feet of new river channel.

The mechanical infrastructure added under Plan B would consist of pump stations at Johns Branch and at Newmans Branch.

The existing lift station and other sewer lines within Milton would requiring extensive relocation work due to levee construction. Inasmuch as possible, sewer lines would be relocated to follow existing rights-of-way, primarily along city streets. Sewer lines would necessarily be buried about 12-15 feet; therefore excavation work would be extensive. Furthermore, the sewer line and life station that crosses the Mud River, just west of Mud River Road Bridge near the fairgrounds, would have to be relocated because of levee construction. This would require trenching in the river that would cause temporary disturbance to the river bottom in that area of the relocation. Disturbance on both banks would occur during relocation, but would be temporary. Work could be performed during low flow to minimize erosion.

Water line relocation work would also be required during construction. It would not be as extensive as sewer line work. Telephone lines and power lines would also require relocation or abandonment in the area.

Mud River Road would be impacted during construction of the gated structures but would not require abandonment or relocation. Further impacts to these roads are discussed in Section 5.5.15, Traffic and Transportation. Other local roads would provide access to any areas affected by the levee structure.

The sewage lagoons located south of the Mud River would not be protected from flooding under Plan B. During periods of flooding, raw sewage may overflow from the lagoons and briefly contaminate downstream sections of the Mud River as would occur under current conditions (No Action). These issues were previously addressed in Section 5.5.13, Public Health and Safety.

Infrastructure Impacts from Plan D

Under Plan D, a levee, two pump stations, two sumps and associated pumps, would be constructed and installed to protect the Milton from flooding. The new levee infrastructure added under Plan D would consist of the following:

- 6,672 feet of levee in Milton.

The mechanical infrastructure added under Plan D would consist of pump stations at Newmans Branch and at Perry Morris Square .

The impacts to sewer and water lines, telephone and power lines, and the sewage lagoons from Plan D would be the same as from Plan B.

5.5.15 Traffic and Transportation

This section discusses the road and rail transportation impacts from the construction and operation of the each alternative. The methodology for assessing the impacts is also discussed. Since the railroad is not currently in operation in the project area, no impacts would occur to rail traffic and transportation from any Plan Discussed. Impacts to the streets and railroad itself are discussed in Section 5.5.14, Infrastructure.

Methodology

Impacts are analyzed in comparison to the existing traffic conditions presented in Section 4.14. The analysis establishes travel routes for construction vehicles and examines the impacts to existing traffic along these routes. It is expected that the major traffic impacts would be temporary and occur during construction of the proposed alternatives. Other than for occasional maintenance of the flood gates, it is expected that traffic impacts would be minimal. During flood events, traffic would be disrupted during closure of the flood gate on Mud River road, however, typically during past flood events, traffic was disrupted on both Mud River road and U.S. Route 60.

In addition, a significant amount of construction materials will be delivered to the project. The assumed distribution of trips to reach Milton is listed: The period of construction would be from March through November, comprising 300 total days of work each year. To establish commuting periods and operational periods of trucks and assorted heavy equipment, several assumptions were made about the workweek. The workweek was assumed to be a six-day week, with construction occurring Monday to Saturday, 8:00 am to 5:00 pm during November through March and Monday to Saturday, 7:00 am to 6:00 pm during April through October.

Traffic and Transportation Impacts from the No Action Alternative

Under the No Action Alternative there would be no impacts to traffic and transportation from construction activities. Vehicle trips would occur at or near the same frequency detailed in Section 4.14 and no excessive delays would be experienced due to heavy truck traffic. However, transportation impacts associated with flooding would continue in Milton.

Traffic and Transportation Impacts from Plan B

Approximately 7700 trucks (hauling 15 cubic yards of material per trip) would be traveling through Milton for the delivery of construction materials. Materials for stone slope protection and granular fill are not available onsite. Materials will be obtained from local commercial sources. Other materials such as concrete, pumps, drainage pipes, and sheet pile would also be delivered to the site. The local traffic patterns could be significantly but temporarily affected as there will only be four access roads to the project. The access roads would be located across from Hillview Road, Mud River Road, Lower Creek Road and Abbott Street near the Middle School.

All borrow (fill) material can be obtained within the CWL. Transportation of the fill material would not involve Mud River Road or any other public road. All material obtained within the CWL for the construction of the levee would utilize access bridges and haul roads that would be temporarily constructed onsite. Fill material from the eastern portion of the site would be transported across Mud River at a temporary bridge east of Mud River Road and transported under the existing bridge to access the western portion of the project.

Construction workers commuting to the project could also have a slight impact both arriving and leaving the site.

Traffic and Transportation Impacts from Plan D

Approximately 1100 trucks (hauling 15 cubic yards of material per trip) would be traveling through Milton for the delivery of construction materials. Stone slope protection and granular fill material are not available onsite. Other materials delivered onsite would be the same as Plan B. The local traffic patterns would be significantly, but temporarily affected as there will only be four access roads to the project. The same access roads would be utilized in Plan D and used in Plan B.

Temporary bridges and haul roads would be constructed within the CWL similar to the description in Plan B, minimizing the hauling of materials on public roads.

Construction workers commuting to the project would also have a slight impact both arriving and leaving the site.

5.5.16 Cumulative Impacts

Evidence is increasing that the most significant environmental effects may not result from the direct effects of a particular action, but from the combination of individually minor effects of multiple actions over time (CEQ 1997). The Council on Environmental Quality (CEQ) regulations implementing the procedural provisions of the National Environmental Policy Act (NEPA) define cumulative effects as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions” (40 CFR 1508.7). The regulations further explain “cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.”

Methodology

The primary resources that are likely to have cumulative effects from other reasonably foreseeable future projects are water and ecological resources. The cumulative effects to water resources occur primarily during high water events, when hydrologic conditions are altered by the flood control structures. The water resource effects are based on a decrease of the floodplain of the Mud River. The cumulative effects to ecological resources occur both during normal flow and high water events, and are primarily impacts to riparian habitats. The following reasonably foreseeable actions are considered in the Milton flood control project cumulative impacts analysis.

Cumulative environmental effects for the proposed alternatives were assessed in accordance with guidance provided by the President's Council on Environmental Quality (USEPA, EPA 315-R-99-002, May 1999). This guidance provides an eleven-step process for identifying and evaluating cumulative effects in NEPA analyses. These eleven steps are grouped into three general phases: scoping; describing the affected environment; and determining the environmental consequences.

Scoping: In this phase, the cumulative effects issues and assessment goals are established, the spatial and temporal boundaries are determined, and reasonably foreseeable future actions are identified. In the current assessment, the cumulative effects issue is to determine if the sustainability of any of the resources is adversely affected, and the goal is to determine the incremental impact to key resources that would occur should Plan B be built.

The spatial boundary for the assessment has already been broadened to consider effects beyond the Contractor Work Limits (CWL) of either alternative in the final array. The Mud River, above Milton, flows through a characteristically different topographical region. The valleys upstream of Milton are steep sloped and drainage is mainly dendritic. Once the Mud River reached the Teays alluvium, the drainage typically changes to meanders through the valley floor sediment and is not constricted by steep hillsides. The spatial boundary being considered is the Lower Mud River watershed and adjacent areas in the ancient Teays River alluvium to its confluence with the Guyandotte River in Barboursville, West Virginia.

The temporal boundaries considered are:

- Past – mid 1900s because this is the approximate time of significant development established in the Milton area.
- Present – 2003 when the decision on a specific flood control alternative is made and project is moved forward
- Future – 2060, the year used for demonstrating the life expectancy of the project of approximately 50 years, after construction is complete (calendar year 2010).

Projecting the reasonably foreseeable future action is difficult. Clearly, the proposed action is reasonably foreseeable. However, the actions by others that may affect the same resources are not as clear. Resources that may be affected by either of the two alternatives include encroachment on the riparian corridor, the 100-year floodplain, and the Mud River, development pressures on terrestrial and aquatic environments, and potential archeological impacts. Projections of those actions must rely on judgments as

to what is reasonable based on existing trends and, where available, projections from qualified sources. Reasonably foreseeable does not include unfounded or speculative projections. In this case, reasonably foreseeable future actions include:

- Impacts due to construction of Regional Airport (2010) that would be located more than 10 miles southeast of the project area and could increase development and encroachment within the Teays Valley and the Mud River Watershed.
- Continued growth in both population and encroachment on the riparian corridor and flood plain of the Lower Mud River.
- Improvements to Interstate I-64 from 2 to 3 lanes.
- Continued increase in tourism/recreation in Milton and area vicinity.
- Continued existing land use patterns throughout most of the region of the Teays Valley.
- Removal of the sewage lagoons located south of the Mud River
- And continued application of environmental requirements such as those under the Clean Water Act.

Geographic Information System (GIS) and Remote Sensing (RS) technologies were employed to analyze the radial urbanization of Milton over a temporal period and the extent of land that would be available for development as a result of the proposed federal action.

The remotely sensed data consisted of aerial and satellite imagery. Aerial photography from 1938, 1971 and 1997 was obtained from the *West Virginia Geologic and Economic Survey* and Ikonos 4 meter multispectral satellite imagery captured in February 2003 was used for determination of radial urbanization. The Ikonos data was also used for comparison of current urbanization and developable land if the proposed action is constructed. The spatial boundaries included the area within the FEMA 100-year floodplain from the upstream near the Georgia Avenue area to the downstream limit of the proposed project (Table 5-11). The area within the FEMA 100-year floodplain is approximately 576 acres. Refer to Figure 5-12.

In 1938, approximately 19% of the floodplain was developed in the core area of Milton (north of the Mud River). By 2003, development has spread in all directions within the study area with vacant land in the business and residential areas. The “with” project action for either alternative would leave approximately 11.7 acres available for development. The significant increase of urbanization of the floodplain from 1938 to 1971 does not coincide with any population increases to the Milton area. Refer to Figure 5-11.

Table 5-11.
Development within the 576 acre FEMA Floodplain

<i>Year</i>	<i>Radial Urbanization (acres)</i>	<i>Floodplain Developed</i>
1938	111	19 %
1971	206	36 %
1988	286	50 %
2003	318	55 %

The same baseline photographs and satellite imagery was used to analyze the Lower Mud River Watershed floodplain development on Open/Agricultural and Riparian areas. Only 1938 and 1997 data were available.

Table 5-12.
Lower Mud River Watershed Floodplain Development

Land Use Type	1938 Acreage	1997 Acreage	Acreage Difference 1997-1938
Total Acreage	1731*	1683.9*	
Open/Agricultural	1016.3	566	-450.3
Riparian	511	644	+133
Urban/Residential	123.6	197	+73.4

*Total Acreage differences from 1938 to 1997 may be considered negligible due to error associated with introducing 1938 aerial photos into GIS.

Total acreage of Open/Ag land use decreased from 1016.3 to 566 acres. Some of this decrease can be attributed to Urban/Residential development and some can be attributed to infrastructure development in the study area (railroads, sewage lagoons, interstate highways, etc.).

With the foreseeable future actions, in addition to the proposed project, the trend for Open/Ag land encroachment will continue as level land becomes scarce in the watershed and within the Teays Valley.

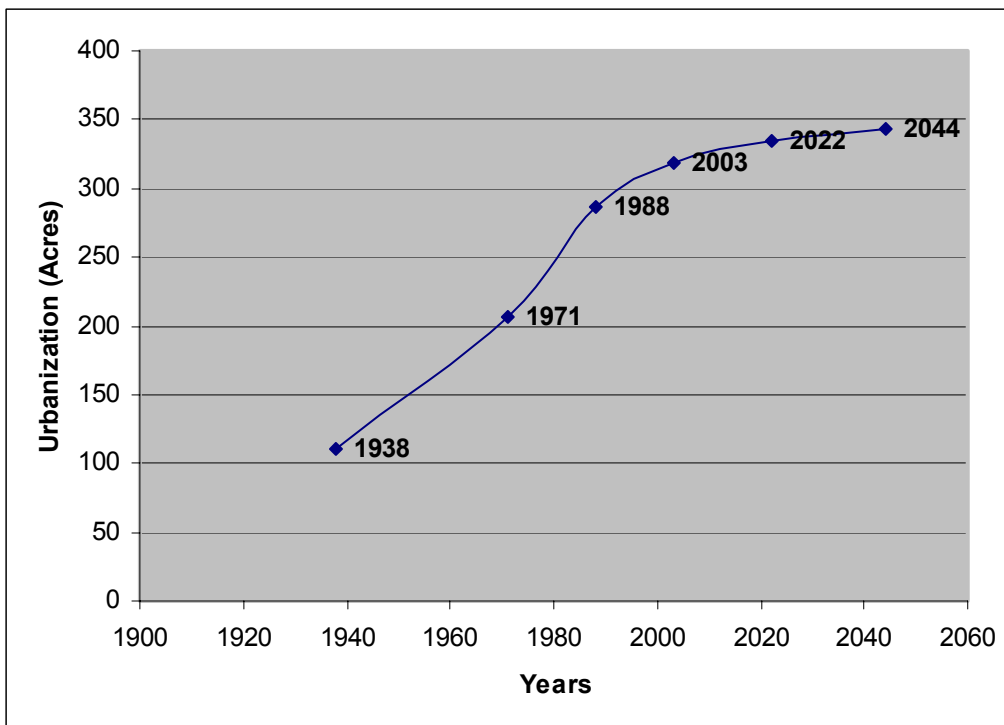
Plan B will permanently utilize 21.7 acres of Open/Ag land within the CWL. Plan D will permanently utilize 5 acres of Open/Ag land within the CWL.

Total acreage of riparian land use increased from 511 to 644 acres over the time period. This increase may be attributed to decline of Open/Ag acreage, therefore allowing succession to take place on the riverbanks and adjacent properties.

With the foreseeable future actions, in addition to the proposed project, the trend for riparian acreages to increase may decline or even be reversed as the pressures of Urban/Residential development will continue as level land becomes scarce in the watershed and within the Teays Valley.

Plan B will permanently utilize 18.43 acres of Riparian land within the CWL. Plan D will permanently utilize 11.64 acres of Riparian land within the CWL.

Figure 5-11. Forecast of development within the FEMA floodplain around Milton



Transportation infrastructure development in the late 19th century with the construction of railroad lines started the fragmentation of habitat and channel modifications to portions of the Mud River. The portion of the Mud River within the geographic scope is approximately 21 miles. In determining past, present and future channelization of the Mud River and its tributaries spatial patterns of the river were evaluated for linear and anomalous trends in flow that did not correspond to physical parameters (i.e. topography, bedrock, etc.).

Figure 5-12. 100-year floodplain within the immediate project area

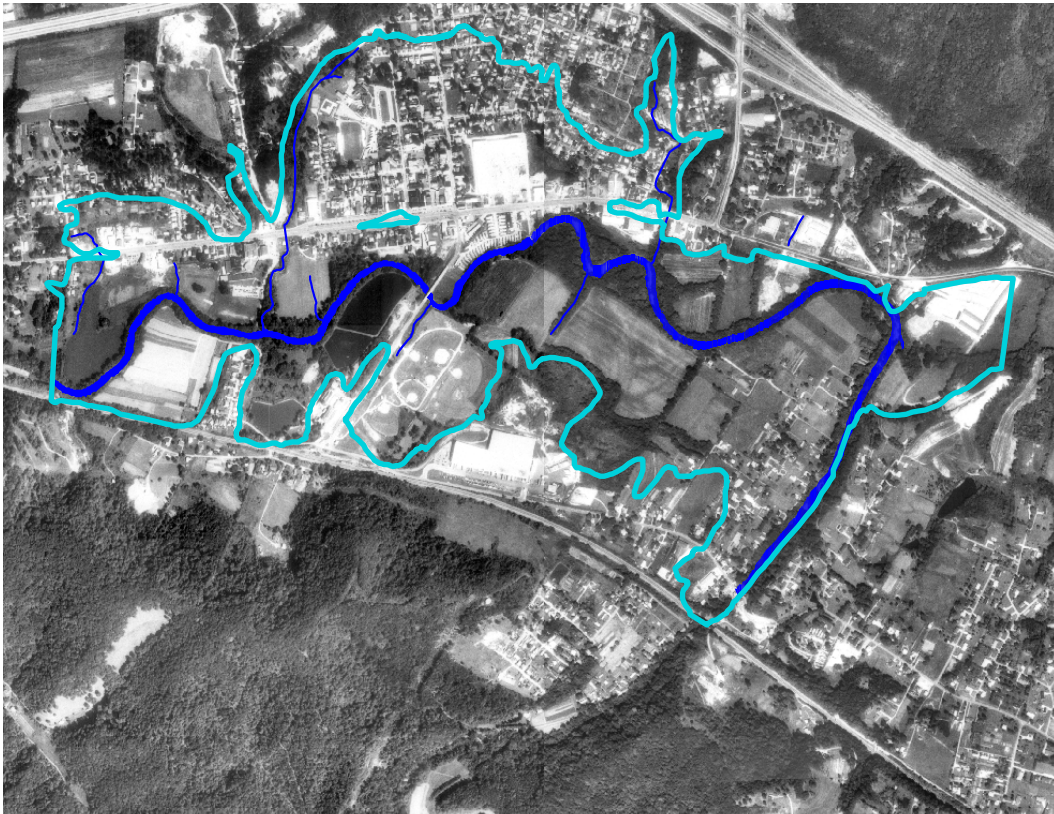


Figure 5-13. Extent of development within the floodplain in 1938

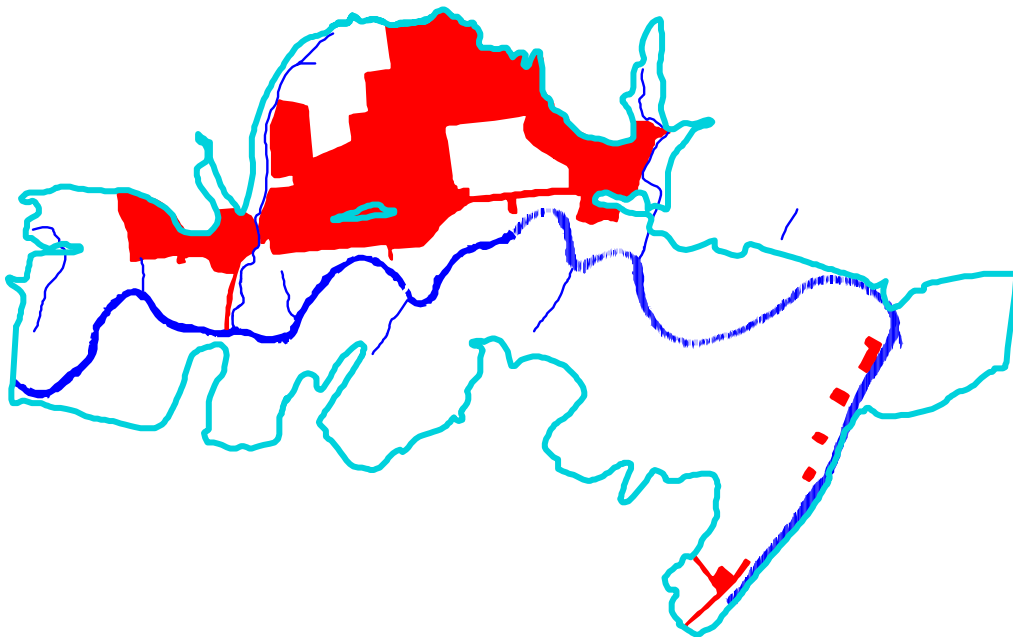


Figure 5-14. Extent of development within the floodplain in 2003

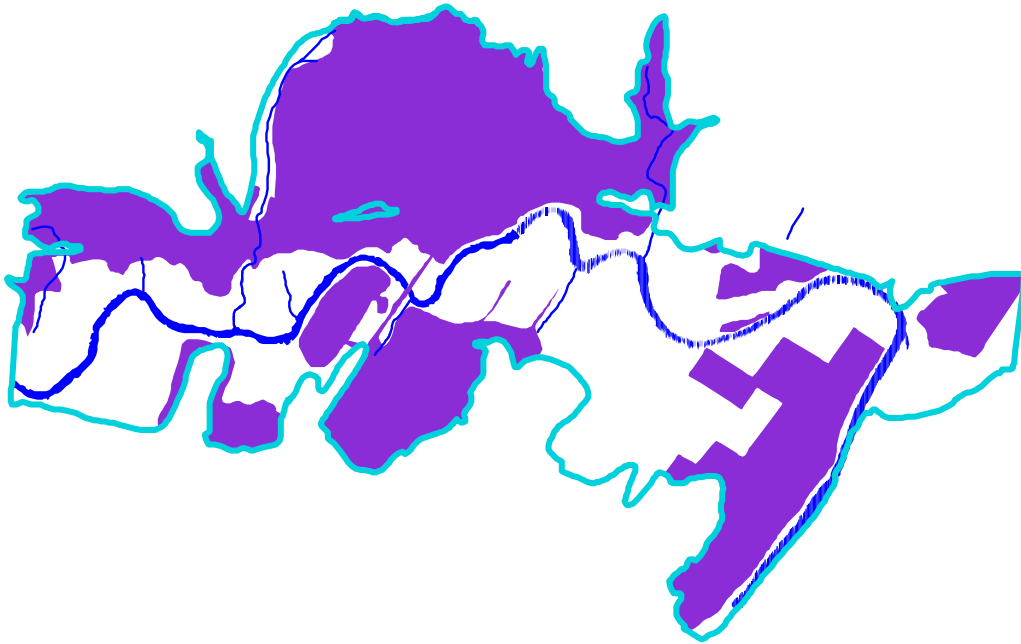
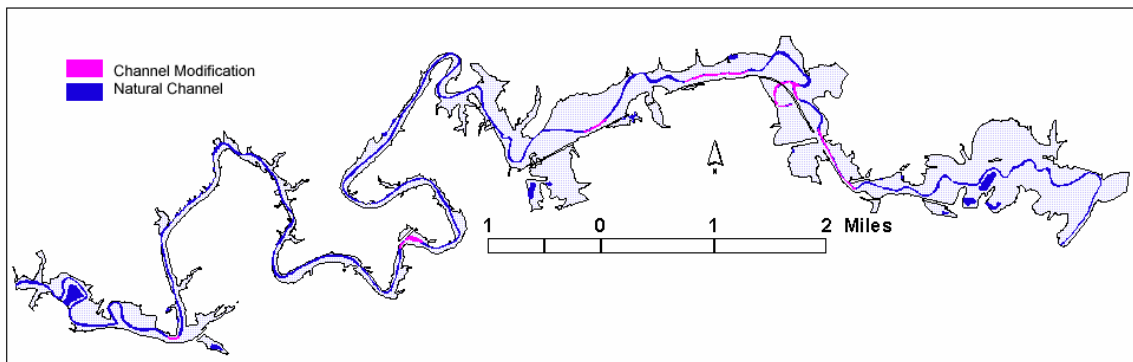


Figure 5-15. Channel Modifications to the Mud River up to 1997



Modifications to the Mud River are primarily correlated with railroad construction. Smaller reaches of the river are modified for construction or upgrades to roadways. A total of 2.5 miles of the Mud River and its tributaries have been channelized. Most of this work is isolated in an historical context with no considerable trend for further modifications. However either alternative would require additional modifications to the Mud River..

5.5.17 Unavoidable Adverse Impacts

The construction of either Plan B or D would have some unavoidable adverse impacts in the project area. Noise generated from construction activities would be an unavoidable adverse impact, but it will be temporary in nature.

Lasting unavoidable adverse impacts would occur to the visual resources of the vicinity. Under either alternative, views that currently include the streams in the project area would be unavoidably restricted by the levee. Views from the river, typically from recreational use such as canoeing and fishing, would be affected aesthetically.

Implementation of either alternative would cause the unavoidable long-term loss of some ecological habitat. Similarly, the taking of houses and business structures is also considered an unavoidable adverse impact to the community. In addition, some small loss in population could be attributed to the project for those whose houses would be taken. Likewise economic and employment losses would be unavoidable for those businesses acquired for the project that did not reopen within the downtown Milton area or its vicinity.

Each alignment design and ponding area was refined to minimize the amount of property needed to construct and maintain for functionality of the project, thus minimizing the number of structures required to be acquired for project implementation. Areas restricted from development will be planted with native terrestrial species.

In Plan B, the new channel would be designed to mimic the existing river, including physical features such as depth and width, rocks, root wads and pools and riffles.

A known archeological site on an initially proposed borrow site for both alternatives was identified. The site was eliminated for use of borrow and that area will be utilized as a staging area for equipment and supplies.

Fugitive dust emissions generated during construction will be suppressed using standard Corps mitigation measures. However, the dust generated would be an unavoidable adverse impact.

5.5.18 Irreversible and Irretrievable Commitments of Resources

This section describes the major irreversible and irretrievable commitments of resources associated with either Plan B or D. A commitment of resources is irreversible when its primary or secondary impacts limit the future options for a resource. An irretrievable commitment refers to the use or consumption of a resource that is neither renewable nor recoverable for use by future generations.

The ecological habitat lost because of the levee construction would be irreversibly committed, as would any previously undiscovered cultural resources that may be encountered during construction.

The primary irretrievable commitment of resources associated with either Plan B or D is the consumption of fossil fuels (gasoline, diesel, hydraulic fluid) by construction.

equipment, and to a much lesser extent, consumption of fossil fuels by maintenance equipment during operation.

Materials used in the relocation of power, water, and sewer lines would also be irretrievably committed. Similarly, concrete and steel would be required for the pump stations and gates. However, at the end of its useful life, these materials could be recycled. The stone used for stone slope protection and levee base has an indefinite useful life, however for the purposes of this analysis it would be irreversibly committed to the project.

5.5.19 Relationship Between Short-Term Use of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Because of the disruption caused by construction of either Plan B or D, there would be significant impacts on short-term uses of the environment in the project area. Implementation of either alternative would cause long-term loss of ecological habitat and associated productivity for those areas where levee infrastructure is placed and for borrow areas. However, for both Plan B and D habitat riverward of the levee included in the proposed property acquisition would not be disturbed and could over the long term revert into more productive habitat. This and the creation of wetlands in the soil borrow and ponding area would contribute to the maintenance and enhancement of long-term productivity of the Mud River ecosystem.

5.6 FINAL SCREENING CRITERIA

The final screening of alternatives is based on an assessment of environmental impacts, economic impacts (costs and benefits), effectiveness (damages prevented by each plan), completeness (number of structures protected), and acceptability.

5.6.1 Environmental Impacts

The Corps Planning Principles and Guidelines state that projects must be consistent with protecting the Nation's environment. Therefore, environmental consequences weigh heavily in the final plan selection. Following is a summary of the significant impacts from construction and implementation of the alternatives including No Action. All impacts are summarized in Table 5-13, below.

Those resource categories having significant impacts from Plan B are: ecological resources, noise and traffic. Specifically, with Plan B about 1.9 acres of wetlands, 3.2 acres of mixed hardwoods, 18.4 acres of bottomland hardwoods and 21.2 acres of old field habitats would be lost from construction of the levee and channel relocation. In addition, the loss of the natural stream channel and the organisms that populate that section of stream. Noise impacts will be significant but temporary near the Milton Middle School. Traffic and transportation impacts would be significant; however, they would occur only during actual construction of the project. Social impacts would be moderate as 6 residences, and 1 businesses would be acquired for project implementation. No impacts to federally listed threatened and endangered species would be expected.

Construction and operation of Plan D would result in impacts similar to those of Plan B except for greater social impacts. The social impacts, including community cohesion, of the relocation of 29 residents and 6 businesses, would be significant for a small city like

Milton. Also, socio-economic resources would be affected as local residents would continue to maintain flood insurance and disinvestment in real property would be expected to continue. With Plan D, about 1.8 acres of wetlands, 3.7 acres of mixed hardwoods, 11.7 acres of bottomland hardwoods and 18.5 acres of old field habitats would be lost. Traffic and transportation impacts would be significant; however, they would be temporary and occur only during actual construction of the project. In addition, the aesthetic impacts of the levee would be significantly greater and alter the visual resources of the area. No impacts to federally listed threatened and endangered species would be expected.

The No Action alternative would have impacts on socio-economic resources of Milton. Without flood protection, occupants within the flood plain would continue to maintain flood insurance and disinvestments in real property would be expected to continue. Further, the business climate in Milton would be expected not to significantly increase in the absence of flood protection. Moreover, the risk to human health and safety from the continued threat of flooding would remain.

Table 5-13. Summary of Environmental Consequences of the Alternatives

Resource Category	No Action	Plan B	Plan D
Land Use	-No change to land use would be expected within the project area. -Potential for increased development in undisturbed areas outside of town -Continued potential for frequent flooding would discourage investment and development	-172 acres affected during construction -70 acres permanently used for levee infrastructure -15.2 acres converted from mixed hardwood and meadow for soil borrow area -Increased investment and development in flood-protected area expected	-119 acres affected during construction -55 acres permanently used for levee infrastructure -15 acres converted from mixed hardwood and meadow for soil borrow area -Continued potential for severe flooding would discourage investment and development
Topography/Drainage	-No impact	-Soil borrow area drainage/topography changed. Channel relocation and ponding area is major change drainage	-Soil borrow area drainage/topography changed.
Geology and soils	-No impacts	-Loss of prime farmland soils.	-Minor impacts to prime farmland soils.
Air Quality	-No impacts	-Minor impacts of fugitive dust and vehicle exhaust emissions during construction.	- Minor impacts of fugitive dust and vehicle exhaust emissions during construction
Noise	-No impacts	-Significant, but temporary impacts during construction.	-Significant, but temporary impacts during construction.
Water Resources	-No impacts	-Permanent loss of natural stream channel.	-Minor and only during construction.
Ecological Resources	-Continued encroachment on riparian and open/ag areas.	-Significant on aquatic resources in location of channel modification. -1.9 acres wetlands, 3 acres mixed hardwoods, 18 acres bottomland hardwoods and 21.2 acres old field habitats	-1.8 acres wetlands, 3.7 acres mixed hardwoods, 11.7 acres bottomland hardwoods and 18.5 acres old field
Cultural Resources	-No impact. Any potential unrecorded resources would not be recorded. Potential decline of property characteristics due to flood damage repair.	-No impact.	-No impact.

Table 5-13. Summary of Environmental Consequences of the Alternatives

Socio-economic	-Flood insurance still required by residences. -Potential business district decline due to continued flooding.	-Some residents still require flood insurance. -Moderate impacts. Acquisition of 6 residences and 1 businesses could result in permanent loss of residents and/or business.	-Flood insurance still required by residences. -Business district decline due to potential for continued severe flooding. -Major impacts. Acquisition of 29 residences, 6 businesses could result in permanent loss of residents and/or businesses.
Recreation	-Potential for continued growth in recreation activities.	-Impacts to parking at festival location. -No protection to Little League Fields.	-No protection to Little League Fields, and limited protection to other recreational facilities in City.
Aesthetics	- Add deferred maintenance and abandonment of businesses and residences.	-Minimal impacts due to location of levee.	-Moderate impacts due to proximity of levee to U.S. Route 60.
HTRW	-No impact.	-No impact.	-No impact.
Health & Safety	-Continued threat due to flooding events.	-Minor impacts during construction especially from truck transport of materials. -No impacts due to future flooding events north of Route 60.	-Continued threat because of potential for severe flooding. -Minor impacts during construction especially from truck transport of materials.
Traffic & Transportation	-Impacted during flood events throughout the area.	-Limited access to south side of levee during flooding events. -Major impacts during construction activities of delivery of materials.	-Limited access during flood event throughout the area -Temporary significant impacts during construction activities delivery of materials.
Cumulative Impacts	-Continued impacts on open/ag and potential riparian encroachment.	- Minor impacts to 21.2 acres of open/ag field which is 3.7% of remaining open/ag fields. -Minor impacts 18 acres of riparian lands which is 2.8% of existing riparian corridor.	- Minor impacts. 18.5 acres of open/ag field which is 3.2% of existing open/ag fields. -Minor impacts to 12 acres of riparian lands which is 1.8% of existing riparian corridor.

5.6.2 Economic Impacts

The costs and benefits for the final alternatives, Plan B and Plan D, are summarized in this section. Project first cost represents the total monetary expense to construct each levee plan. The base year for economic analysis is 2010, which is the earliest estimated completion date for either plan. The construction period for Plan B is estimated to be 4 years – 2006 to 2010, while the construction period for Plan D is estimated to be 3.5 years – 2006 to 2010. Both benefits and costs are expressed in October 2002 prices.

First Cost

First costs and benefits for Plans B and Plan D are summarized in Table 5-14. Costs are given for each feature code of accounts, including contingencies. Detailed cost to the sub-feature level are provided in the Baseline Cost Estimate in the Engineering Appendix. First includes project construction real estate acquisition, environmental mitigation, and engineering and design.

Table 5-14
First Cost of Final Plans
Millions -October 2002 Price Level

Feature	Item	Plan B	Plan D
01	Lands and Damages	\$4.91	\$ 5.70
02	Relocations	\$1.07	\$ 0.94
06	Fish & Wildlife Facilities	\$1.86	\$0.46
09	Channels & Canals	\$0.99	\$0.00
11	Levees and Floodwalls	\$14.82	\$7.68
13	Pumping Plants	\$6.03	\$5.50
22	Feasibility Studies	\$3.00	\$3.00
30	Engineering and Design	\$4.19	\$ 3.21
31	Supervision and Admin	\$1.75	\$1.07
	Total	\$ 38.65	\$ 27.56

Annual Cost and Benefits

The annual costs for the final plans are the summation of the annualized capital cost and estimated operation and maintenance cost. Annual capital costs include interest and amortization charges on the investment cost and have been computed using an interest rate of 6 1/8% and an economic life of 50 years. The estimated O & M costs are based on actual cost experience for similar local flood protection projects constructed by Huntington District. These costs include maintaining the earthen levee and operating the pump stations and the gate closures. The O & M costs are shown in Table 5-15.

The benefits for each of the final plans represent flood damages prevented up to the designed level of protection for each levee project expressed in annual values. Benefit categories include residential, commercial, personal property, utilities, transportation, and reduction of emergency cost. The benefits were computed over a 50-year period using standard discounting procedures and an interest rate of 6 1/8 %. A summary of

average annual benefits, average annual costs, net benefits, and benefit-to-cost ratio are presented in Table 5-15.

Table 5-15
Summary of Benefits and Costs

Item	Plan B	Plan D
Annual Benefits	\$3,446,000	\$2,302,000
Annual First Cost	\$2,685,000	\$1,915,000
Annual O&M	\$32,000	\$23,000
Total Annual Cost	\$2,717,000	\$1,938,000
Net Benefits	\$729,000	\$364,000
Benefit-to-Cost Ratio	1.3	1.2

5.6.3 Evaluation Criteria

Efficiency

Efficiency is the extent to which an alternative plan is cost effective in alleviating identified problems. Efficiency generally is associated with the plan having the greatest net benefits, but it extends beyond NED criteria. The most efficient plan is the least costly means of achieving planning objectives when all outlays are considered, both monetary and non-monetary. Plan B has the greatest net benefits and in accordance with Corps guidance is the NED plan. This plan results in significant environmental impacts; however, mitigation of the negative impacts has been accounted for in terms of monetary and non-monetary resources. Benefit-to-cost ratios (BCR) are another means of evaluating the efficiency of a water resource project. Plan B has the highest BCR (1.3), while the BCR for Plan D is 1.2. In terms of Corps criteria for project evaluation, both Plans B and D are reasonably efficient.

Effectiveness

Effectiveness is the extent an alternative plan alleviates identified problems and achieves the planning goals. It generally describes the physical attributes of the alternative plans. An effective plan is one that is responsive to the wants and needs of the citizens, and makes significant contributions to the planning objective. Plan B is the most effective in that it protects 98% of the structures that would be damaged by the 1% annual flood, and provides protection up to the 0.4% annual flood. Annual residual damages would be approximately \$157,000 for a reduction of 96% of the without project conditions. Plan D is not as effective because it only provides protection against those floods which have an estimated return frequency of 20-years, such as the 1997 flood. Due to the large number of structures and city infrastructure that would be left unprotected, the annual residual damages would be \$1.3 million, which constitutes a considerable risk for the people and property in Milton. In addition to the fact that a large portion of the City of Milton would be left unprotected by Plan D, the structures that are protected (those in the 20-year floodplain) would still be to subject to flooding by overtopping of the levee by higher level events. Using accepted flood frequency analysis, the Plan D levee would have the potential for overtopping at least four times during 100-years, or potentially twice during the economic life of the project. (These

numbers are based on statistical probabilities and the actual number of overtopping events could be greater or less than the potential stated above.)

Acceptability

Acceptability is the viability of the alternative plan with respect to acceptance by state and local entities, project sponsors, and the public, and compatibility with existing laws, regulations, and public policies. There are two primary aspects to acceptability. One is the ability to implement the project, meaning it is feasible in the technical, environmental, and economic sense. To be acceptable to state and local entities as well as the public, the plan has to be achievable. There are many factors that can make a plan infeasible, such as technical (engineering or natural), economic, environmental, social, political, legal, and institutional. If a plan cannot be developed for any legitimate reason it is not feasible. The other aspect to acceptability is the satisfaction it brings to people – the sponsor as well as the public at large. However, the fact that a particular plan has opposition or is not the favored plan of the non-Federal sponsor does not make it unacceptable. Opposition may make a plan unpopular or difficult to develop, but not necessarily unacceptable.

Plan B fully meets all the criteria for acceptability. It is engineeringly, economically, and socially feasible, and there are no legal or institutional constraints. It is unpopular from an environmental standpoint because there are significant impacts to aquatic habitat associated with a loss of natural stream channel. However, the impacts can be mitigated by specific measures incorporated in the project development plan. During the monthly update and scoping meetings since November 2002 with the project sponsor and citizens action group, each plan was presented to the public and Plan B is the first choice of the project sponsor and the local citizenry, because there are minimal impacts to businesses and residences in the City of Milton. Plan D meets most of the criteria for acceptability. The plan is economically feasible and implementable, however there are physical (natural) constraints which limit the level of flood protection to that of the 1997 flood, estimated to be a 20-year event. Because of the significant risk (residual damages) associated with the plan and the potential for more frequent overtopping, Plan D is the second choice of the public.

5.6.4 Plan Selection

Two flood control levees have been carried forward as the final alternative plans for providing flood protection to the City of Milton. The primary planning objective was to develop the most economically feasible plan (NED) and the most environmentally acceptable plan to reduce flood damages at Milton. Plan B provides a high level of protection, but includes modification to the Mud River channel. Plan B has the greatest net benefits and is the NED plan. Plan D provides a lower level of protection, only to the approximate elevation of the 1997 flood; however, the project first cost is about 30% less than Plan B. Although Plan D affects several businesses and residences, the impacts on the natural environment are minor; therefore it is the environmentally preferred plan.

Corps planning guidance stipulates that the recommended plan must have incremental benefits in excess to cost (net benefits and positive BCR) and the recommended plan must provide the maximum net benefits unless there are significant reasons otherwise. Both Plan B and Plan D are economically feasible with substantial net benefits. Plan B provides a higher level of protection and much greater net benefits than Plan D. There

are significant environmental impacts associated with construction of Plan B, but these impacts are fully offset by special measures in the mitigation plan. Plan D does not provide a high level of protection, but would protect most of Milton from a recurrence of the 1997 flood, with 90% assurance. The environmental impacts of construction are minor and the cost of the project is about 30% less than Plan B.

In consideration of the above, that Plan B provides the highest level of flood protection, has the greatest net benefits, and all significant environmental impacts are mitigated by special project features, Plan B therefore is the selected plan. Table 5-16 provides a summary comparison of the final alternative plans in support of the selection of Plan B.

Table 5-16
Milton Local Protection Project
Summary Comparison of Final Alternative Plans

	No Action	Plan B	Plan D
1. Plan Description	Without project condition / no flood protection.	Levee at Milton with Mud River channel modification. High Level Protection	Levee at Milton along north bank of Mud River. Low Level Protection
2. Economic Analysis			
A. Project cost	\$0	\$38.65 M	\$27.56 M
Federal	NA	\$28.99 M	\$20.67M
Non Federal	NA	\$9.66 M	\$6.89 M
B. Real Estate	NA	\$4.91 M	\$5.70 M
C. Annual Cost	NA	\$2.7 M	\$1.9 M
D. Annual O&M	NA	\$32 K	\$23 K
E. Annual Benefits	\$0	\$3.45 M	\$2.30 M
F. BCR	NA	1.3	1.2
3. Environmental Impacts			
A. Surface Water	Existing quality will continue.	Significant, permanent modifications along 4,084 feet of Mud River.	Minor impacts only during construction.
B. Aquatic Resources	Existing quality will continue.	Significant impacts along 4,084 feet of natural stream channel.	Moderate impact. Existing quality should continue.
C. Terrestrial Resources	Existing quality will continue	Significant impacts from loss of 3.2 acres of mixed hardwoods, 18.4 acres bottomland hardwoods and 21.2 acres old field habitats.	Impacts from loss of 3.7 acres mixed hardwoods, 11.7 acres bottomland hardwoods and 18.5 acres old field
D. Cultural and Archeological Resources	No impacts.	Moderate impacts only during construction.	Major adverse impacts to residential and commercial structures along north river bank.
E. Recreation Resources	No impacts.	Impacts to parking at festival location and fairgrounds area	No impact
F. Aesthetics	No impacts.	Visual impacts from earthen levee and stream relocation.	Visual impacts from earthen levee.

G. Wetlands	No impacts.	Loss of 1.9 acres wetlands.	Loss of 1.8 acres wetlands.
4. Social Effects			
A. Public Safety	Significant flood hazard continues in Milton.	Significantly reduced potential for property damages in Milton.	Considerable reduction in potential for property damages in Milton. Flooding risk remains.
B. Community Cohesion	Flood threat may alter town development.	Construction requires relocation of water supply intake. Loss of residences and businesses.	Loss of residences and businesses due to project construction.
Item	No Action	Plan B	Plan D
C. Business Activities	Business activities constrained by repeated flooding.	Significantly improved conditions for businesses inside protection limits.	Improved conditions for businesses inside protection limits. However, flood risk remains.
D. Recreational Activities	Fairground facilities and ballfields will continue to flood.	Parking for ball field and fairgrounds impacted.	No significant impacts.
5. Evaluation Criteria			
A. Effectiveness (residual damages)	No reduction in annual average flood damages of \$3.6M.	Residual damages = \$157K, for a reduction of 96% of the average annual expected damages.	Residual damages = \$1.3 M, for a reduction of 64%.
B. Flood Protection	Significant damages begin at about 10-year frequency. Does not meet objectives.	Milton protected to 250-year frequency flooding. Meets all objectives.	Milton protected to 20-year frequency flooding. Meets some objectives.
C. Minimize Environmental Impacts	Habitats are not affected.	Plan mitigates impacts from channel relocation.	Plan mitigates social and environmental impacts.
D. Acceptability	Not acceptable. Does not meet planning constraints.	Acceptable. Meets all planning constraints.	Acceptable. Meets most planning constraints.